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These are a selection of significant turbine foundations design projects carried out by Wideurope Engineering Italy to best present works such as Steam Turbine multi-level Foundations, Gas Turbine Foundations, on piles, soil, springs, diagnostic surveys and studies for repairing damaged sections, modification of existing pedestals for new machines.

Tirreno Power plant – Vado Ligure, Savona, Italy
Combined Cycle Power Plant
2x240 MW Ansaldo Gas Turbine
380 MW Ansaldo Steam Turbines
COUNTRY: Singapore

YEAR: 2014

CLIENT: GE Energy

OWNER: SRC Singapore Refining Company Private Limited

TYPE OF CONTRACT: Design Review on GT Foundation type FRAME 6B

DESCRIPTION OF WORK

Design Review and verification on GT CW execution Drawings including verification of Geotechnical interpretation report, verification of input checked both for geotechnical data and loads, revision of the foundation dynamic and static calculation and output implementation on the drawings, completeness and correctness of formworks and steel reinforcement drawings and calculation report comply with international standard GE guide drawings.
COUNTRY: Algeria

YEAR: 2013

CLIENT: GE Energy - Power & Water

OWNER: Sonatrach

TYPE OF CONTRACT: Civil Detailed Design including HVAC, Ventilation System and Networks

DESCRIPTION OF WORK
Design and Engineering Services for Hassi Berkine Power Station - all the foundation under equipment including GT Pedestal for 1 GT 9000 E, GT Hall (modification and adaptations), HVAC and Ventilation System, Networks and Buildings Finishing.

The power plant is installed at oil production place called Hassi Berkine, 300 km South from the city of Hassi Messaoud, 900 km South from Algeris. The power plant is installed in province of Ouargla.

WORK UNITS IN SCOPE OF WORK

<table>
<thead>
<tr>
<th>KKS</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>UMX</td>
<td>MASSIF TURBO-ALTERNATOR</td>
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<td>UMZ</td>
<td>AIR FILTER &amp; INLET</td>
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<tr>
<td>UHN</td>
<td>EXHAUST CHIMNEY &amp; EXHAUST CWGD</td>
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<tr>
<td>UHX</td>
<td>WASHING WATER COLLECTING PIT</td>
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<td>UMX</td>
<td>GAS MODULE</td>
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<td>UMX</td>
<td>LUBE OIL RECOVERY PIT</td>
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<td>URC</td>
<td>FIN FAN COOLER</td>
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<tr>
<td>UHV</td>
<td>WASHING SKID</td>
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<td>UTX</td>
<td>CO2 SKID</td>
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<tr>
<td>UMX</td>
<td>ACOUSTICAL ENCLOSURE TG SLAB</td>
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<td>UMX</td>
<td>ROTOR REMOVAL</td>
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<td>UMB</td>
<td>FLOORS DEMOLITION - ENGINE ROOM</td>
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<td>UMX</td>
<td>GENERAL ARRANGEMENT SIMPLEX - GAS FILTER SIMPLEX</td>
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<tr>
<td>UHN</td>
<td>CHIMNEY WATER PIP</td>
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<td>UTF</td>
<td>AIR COMPRESSOR SKID</td>
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<tr>
<td>UBX</td>
<td>MECH CONCRETE TRENCHS &amp; SUPPORTS</td>
</tr>
<tr>
<td>UMX</td>
<td>SECURITY GAS VALVE - SSOV SKID</td>
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</tbody>
</table>

STANDARD CODE APPLIED: Règles BAEL 91 révisées 99
Règles PARASISMES ALGERIENNES RPA 99 / Version 2003
NFP 94-500 (Missions Géotechniques Types) - Revision Décembre 2006
**BIR M’CHERGA POWER PLANT**

**COUNTRY:** Tunisia  

**YEAR:** 2012  

**CLIENT:** GE Energy  

**OWNER:** STEG - Société Tunisienne de l’Electricité et du Gaz  

**TYPE OF CONTRACT:** 2x125 MW Gas Turbine Outdoor Civil Design for Fast Track Project  

**TYPE OF MACHINE:** 2x9000E  

**DESCRIPTION OF WORK**
Civil Design for 2 GT 9000E generator foundations pedestals, associated Auxiliaries (air filter, chimney & stack, acoustical packages, fin fan coolers, washing water skid, GT gas area, CO2 rack) electrical containers, transformers compound, travelling crane, switchyard foundations, networks, roads and fence.
COUNTRY: KSA

YEAR: 2012

CLIENT: Ansaldo Energia

OWNER: SWCC

TYPE OF CONTRACT: Diagnostic survey and study on damaged concrete foundations

TYPE OF MACHINE: Medina Yanbu 7 - 80 MW - Steam Turbine Foundation

DESCRIPTION OF WORK
Site visit and detailed diagnostic study for steam turbine foundation #7 after damaging event. Preparation of Technical Report detailing the possible solutions to overcome the structural and anchorages damages defining processes and materials to be used for rehabilitating the Turbine Foundation.

Two Technical Reports has been provided after site inspection and laboratory tests for concrete investigation:
1) INSPECTION REPORT with remedial works suggestions
2) PEDESTA - METHOD STATEMENT GROUTING PROCEDURE with Check List

To guarantee the best performances of the sole plates foundation, the only remedial recourse is to remove the defective pockets and to re-grout the sole plates with epoxy grout Sikadur-42 LE or similar. Before doing this, it’ll be necessary to re-position the turbine at the propel level.

![Turbine sole plate foundation after investigation, the concrete and grouting has been demolished for inspection.](image1)

![Turbine Sole Plates in position after Grouting Activities.](image2)
COUNTRY: Malaysia

YEAR: 2012 - Project Under Construction

CLIENT: Alstom Power

OWNER: Malakof Coorporation Berhad

TYPE OF CONTRACT: 1x1.000 MW Civil Design Improvement

DESCRIPTION OF WORK
Site assistance and local coordination including permitting activities developed in Joint Venture with a Malaysian Engineering Company. Piling Design, Preliminary Design, Detailed Design and Final Design for the following Work Units along the POWER BLOCK:

- Boiler
- Bunker Bay
- Fabric Filter
- Flue Gas Ducts
- Steam Turbine Hall
- Slag Conveyors
- Flue Gas Desulfurization Absorber / Reactor Tower
- Reactor Tower
- Booster Fans
- Aeration Fan Area
- Flue Gas Desulfuration Ducts
- Absorber supply and discharge piping
MANJUNG 4 COAL FIRED POWER PLANT - ALSTOM POWER

COUNTRY: Malaysia

YEAR: 2011 - Project Under Construction

CLIENT: Alstom Power

OWNER: Tepsco/Miniconsult

TYPE OF CONTRACT: 1x1.000 MW Coal Fired Power Plant

DESCRIPTION OF WORK
Site assistance and local coordination including permitting activities developed in Joint Venture with a Malaysian Engineering and Construction Company.
Civil and structural design criteria, Floor seismic response spectra, Piling Design, Preliminary Design, Detailed Design, Final Design for the following Work Units along the POWER BLOCK:

- Boiler
- Bunker Bay
- Air Preheater
- Fabric Filter
- FD & PA Fan
- Central Electrical Building
- Boiler Electrical Building
- Steam Turbine Hall
- Steam Turbine and Generator Foundation Block
- Flue Gas Monitoring
- Bottom Ash Silo Foundations

- Utilities
- Emergency Diesel Generator
- Gas Storage
- Condensate Make-Up Tank
- Fabric Filters
- Flue Gas Desulfuration Electrical Building
- FGD Pump Building Aeration Basin
- Flue Gas Desulfuration Absorber / Reactor Tower
- Booster Fans
- Aeration Fan Area
- Flue Gas Desulfuration Reaction Basin
- Flue Gas Desulfuration Water Piping
COUNTRY: France

COMPLETION YEAR: 2010

CLIENT: GE Energy

TYPE OF CONTRACT: Standard Plant S109FB-SS Block 3 for Competitiveness / Civil Design Optimization

DESCRIPTION OF WORK

Design of Building and Equipment foundation including Static and Dynamic Analysis, formwork, reinforcement ratios and structural steel for GAS TURBINES PEDESTAL Frame 9FB - Single Shaft Power Train.

HRSG AREA FOUNDATION WITH STACK
GT HALL BUILDING
GT HALL LOW BAYS for AUXILIARIES
FEED WATER PUMPHOUSE

The principal of founding on a thick raft generalized over the whole PI area has been revised to a combination of strip foundations, spread footings with grade beams and local rafts pending loading conditions and available space.

This modified approach to the design has resulted in the following quantity variations:

<table>
<thead>
<tr>
<th>PERCENTAGE</th>
<th>MATERIAL</th>
<th>SAVING IN QUANTITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>28%</td>
<td>less Concrete</td>
<td>2.348 m³</td>
</tr>
<tr>
<td>40%</td>
<td>less Reinforcement</td>
<td>375,000 kg</td>
</tr>
<tr>
<td>28%</td>
<td>less Formwork</td>
<td>991 m³</td>
</tr>
</tbody>
</table>

TOTAL EXPECTED SAVINGS 6,000 Euro

NOTES:

NO negative impact on the project schedule.
Study valid only for standard design to be adapted for each project according to:
• Actual site conditions;
• Local laws, local codes;
• Standards and specific RFQ.
COUNTRY: Iraq

COMPLETION YEAR: 2009

CLIENT: Baghdad Company LTD.

CONSULTING ENGINEER: Uruk Engineering & Contracting

TYPE OF CONTRACT: Civil Design of 2x50 MW New Turbo Generator Foundations; including Auxiliary Foundations + Electrical Cable Designs

DESCRIPTION OF WORK
GE FRAME 5 – 2 Turbo Generator Foundations Design.
Calculation Report: Static and Dynamic Analysis for Concrete Foundation and Pile Dimensioning.
Drawings: Piles Layout, Reinforcement and Details, Formworks, Steel Reinforcement, Bars Bending Schedule, Electrical Documents.

STRUCTURE DESCRIPTION
The gas turbine foundation is a so-called low tuned plate foundation. The foundation consists of a base mat resting directly on 48 Ø 500 mm piles.
IPP CONGO

COUNTRY: Congo

COMPLETION YEAR: 2008

CLIENT: STI (ABB)

CONSULTING ENGINEER: ENI Congo

TYPE OF CONTRACT: Calculation and Design of 2 Gas Turbine Foundations V94.2 Open Cycle (225 MW)

POWER PLANT CHARACTERISTICS: 450 MW Power Output based on 2x225 MW Ansaldo Gas Turbines

DESCRIPTION OF WORK
Calculation Report: Static and Dynamic Analysis of Base Mat Foundation located at the Ground Floor of the Turbine Building.
Drawings: Piling Layout, Piles Details, Formworks, Steel Reinforcement, Bars Bending Schedule Inserts and Embedded Items Details.

STRUCTURE DESCRIPTION
The foundation consists of a base mat resting directly on 45 Φ 600 mm piles, with walls and plinth on top.
COUNTRY: Iran

COMPLETION YEAR: 2008

CLIENT: STI (Ansaldo)

CONSULTING ENGINEER: FATA EPC

TYPE OF CONTRACT: Calculation and Design of Gas Turbine Found. V94.2 Open Cycle

POWER PLANT CHARACTERISTICS: 640 MW Power Output based on 4 Ansaldo Gas Turbines

DESCRIPTION OF WORK
Gas Turbine Foundation Design.
Calculation Report: Static and Dynamic Analysis of the Mat Foundation Plate Elements.
Drawings: Piling Layout, Pile Details, Formworks, Steel Reinforcement, Bars Bending Schedule, Inserts and Embedded Items Details.

STRUCTURE DESCRIPTION
A reinforced concrete plate with different thickness constitutes the structure of a gas turbine foundation, directly based on 39 Φ 800 mm piles.
COUNTRY: Italy

COMPLETION YEAR: 2008

CLIENT: Fenice S.p.A

CONSULTING ENGINEER: EDF

TYPE OF CONTRACT: Civil Design of Steam Turbine Pedestal and Final Functional Testing

POWER PLANT CHARACTERISTICS: 6 MW Power Output based on FINCANTIERI Steam Turbine used for the entire Mechanical Manufacturing Cycle.

DESCRIPTION OF WORK
Replacement of current Turbine Alternator with a new one by Re-Dimensioning the Existing Foundation: partial demolitions to create openings and increase of Operative Floor & Columns. Concrete Sections to Support the New Machine.
Calculation Report: Static and Dynamic Analysis of Existing and Modified Pedestal Foundation.
Drawings: Demolition, Repair and Reconstruction Details, Formworks, Steel Reinforcement, Bar Bending Schedule.

STRUCTURE DESCRIPTION
The structure of the steam turbine foundation is constituted by a mat foundation from which six columns carry the operation floor: the two under the generator have been enlarged in dimension because of the increasing of the loads. The six columns are almost symmetrically placed along longitudinal axis of foundation.
COUNTRY: France

COMPLETION YEAR: 2007

CLIENT: Fincantieri

CONSULTING ENGINEER: Chambéry Métropole

TYPE OF CONTRACT: Civil Design of New Steam Turbo Generator Pedestal

POWER PLANT CHARACTERISTICS: TURBOALTERNATEUR A CONDENSATION with 6,8 MW Power Output Capacity based on Fincantieri Steam Turbine.

DESCRIPTION OF WORK
Steam Turbine Foundation Design.
Drawings: Formworks, Steel Reinforcement, Bars Bending Schedule of G/T Foundation.

STRUCTURE DESCRIPTION
A reinforced concrete plate constitutes the structure of the steam turbine foundation with different thickness directly placed on soil.
COUNTRY: Italy

COMPLETION YEAR: 2007 - 2008

CLIENT: Fincantieri

CONSULTING ENGINEER: Energy Recuperator S.r.l.

TYPE OF CONTRACT: Civil Design of New Steam Turbo Generator Pedestal

POWER PLANT CHARACTERISTICS: 5.1 MW Power Output based on Fincantieri Steam Turbine.

DESCRIPTION OF WORK
Steam Turbine Foundation Design placed inside an Existing Power House. Existing Pedestal Demolition Supervision.
Calculation Report: Static and Dynamic Analysis of Existing Concrete Foundation Pedestal.
Drawings: Formworks, Steel Reinforcement, Bars Bending Schedule.

STRUCTURE DESCRIPTION
The structure of the steam turbine foundation is constituted by a mat foundation from which six columns carry the operation floor. The six columns are almost symmetrically placed along the longitudinal axis of the foundation along the operating floor.
PIEVE DI TECO COGENERATION POWER PLANT

COUNTRY: Italy

COMPLETION YEAR: 2007

CLIENT: Fincantieri

CONSULTING ENGINEER: Energy Recuperator S.r.l.

TYPE OF CONTRACT: Civil Design of New Steam Turbo Generator Pedestal

POWER PLANT CHARACTERISTICS: 3,1 MW Power Output based on Fincantieri Steam Turbine.

DESCRIPTION OF WORK
Steam Turbine Foundation Design.
Calculation Report: Static and Dynamic Analysis of Concrete Foundation Pedestal and Piles Dimensioning.
Drawings: Piles Layout (Nr. 24 Φ 200 Piles) and Details, Formworks, Steel Reinforcement, Bars Bending Schedule.

STRUCTURE DESCRIPTION
The structure of the steam turbine foundation is constituted by a mat foundation from which six columns support the operation floor (with different thickness) and openings due to condenser. The six columns are almost symmetrically placed along the longitudinal axis of the foundation.
PINGARATI COGENERATION POWER PLANT

COUNTRY: Romania

COMPLETION YEAR: 2007

CLIENT: Fincantieri

CONSULTING ENGINEER: Energy Recuperator S.r.l.

TYPE OF CONTRACT: Civil Design and Technical Assistance of a New 6,5 MW Steam Turbo Generator Pedestal

POWER PLANT CHARACTERISTICS: 6,5 MW Power Output based on Fincantieri Steam Turbine.

DESCRIPTION OF WORK

STRUCTURE DESCRIPTION
The structure of the steam turbine foundation is constituted by a mat foundation directed placed on soil from which six columns carry the asymmetrical operation floor.
COUNTRY: Kuwait

COMPLETION YEAR: 2007

CLIENT: C.P.S. Creative Power Solutions

CONSULTING ENGINEER: Ministry of Energy Kuwait


POWER PLANT CHARACTERISTICS: 6x40 MW Power Output based on General Electric LM 6000 Aero Derivative Gas Turbines.

DESCRIPTION OF WORK
Gas Turbine Foundations Design.
Calculation Report: Static and Dynamic Analysis for the LM 6000 Turbine Foundation and Chimney.
Drawings: Piling Layout (24 Squared Piles), Piles Details, Formworks, Steel Reinforcement, Bars Bending Schedule, Inserts and Embedded Items Details.

STRUCTURE DESCRIPTION
The structure of the turbine foundation is constituted by a mat foundation on 24 squared piles, longitudinally staggered.
COUNTRY: Algeria

COMPLETION YEAR: 2007 - 2008

CLIENT: Fincantieri

CONSULTING ENGINEER: ENIP

TYPE OF CONTRACT: Civil Design of Steam Turbine Pedestal and Final Functional Testing

POWER PLANT CHARACTERISTICS: 18,7 MW Power Output based on Fincantieri Steam Turbines.

DESCRIPTION OF WORK
Verification of Existing Steam Turbogenerator Foundation, including Repairing and Design.
Calculation Report: Static and Dynamic Analysis of Existing Concrete Foundation Pedestal.
Drawings: Demolition, Repair and Reconstruction Details, Carbon Fibre Reinforcement Details, Formworks, Steel Reinforcement, Bars Bending Schedule, Technical Design Criteria for Execution Works; Bill of Quantities and Technical Specification Tender, Site Supervision and Assistance; Diagnostic Survey for Existing Concrete Structure, Control Quality Plan, Construction Material and Diagnostic Instrumentation. Supply and Transportation of Concrete Repair Materials.

COMMENTS
The new turbine installation needed a re-dimensioning of the existing foundation with an increase of the existing concrete pedestal.
We also provided the following material analysis:
1. micro seismic surveys with ultrasounds (UNI 9524-89);
2. determination of Sclerometric index (UNI EN 12504-2: 2001);
3. standard practice for Petrography Examination of Hardened Concrete (ASTMc/856/02);
4. water soluble salts determination (UNI 11087);
5. determination of frameworks position with relevant diameter valuation of the steel bars by pacometer BS 1881;
6. determination of the carbonation depth (UNI 994-92);
7. technical report.
COUNTRY: Italy

COMPLETION YEAR: 2006

CLIENT: AEM (Azienda Energetica Metropolitana) Torino S.p.A.

CONSULTING ENGINEER: FATA EPC

TYPE OF CONTRACT: Existing Steam Turbine Operation Floor (On Springs) Analysis and Section Enlargement Design To Support New Machines

POWER PLANT CHARACTERISTICS: 60 MW Power Output

DESCRIPTION OF WORK
Verification of Existing Steam Turbo Generator Foundation, including Repairing and Design, Study for Operating Floor on Change of Springs for Replacement of Steam Turbine-Alternator. Study of Partial Demolition and Increased Longitudinal Section Beams for New Turbine Housing Anchorages. Calculation Report: Static and Dynamic Analysis for Concrete Foundation. Drawings: Existing Layout, Demolitions, New Construction Formworks, Steel Reinforcement, Bars Bending Schedule, Inserts and Details.

STRUCTURE DESCRIPTION
Operation floor connected by springs, to the existing columns and beams, constitutes the structure of the turbine foundation.
KESTREL GAS-FIRED - CCPP 22 PROJECT DUBAL

COUNTRY: UAE

COMPLETION YEAR: 2006

CLIENT: STI - Alstom Power Belfort

CONSULTING ENGINEER: Dubal Dubai Aluminium Smelter Complex - Dubai

TYPE OF CONTRACT: Civil Detailed Design and Site Supervision

POWER PLANT CHARACTERISTICS: 430 MW Combined Cycle Power Plant based on GT13E2 gas turbines.

DESCRIPTION OF WORK
Civil Detailed Design and Site Supervision for the following works:

- heat recovery steam generator,
- boiler feed pump area & deaerator,
- turbine electrical modules,
- st electrical building,
- gt foundation block,
- condenser pit,
- steam turbine & generator foundation block,
- gt/st turbine building,
- transformer area,
- gt outdoor auxiliaries,
- blast / by-pass stack,
- fuel gas treatment area,
- cooling water outfall,
- cooling water piping,
- cable way from transformer to gis station,
- pretreated water storage,
- pretreated water station,
- demineralized water production,
- demineralized water storage,
- compressed air tank,
- emergency diesel generator,
- oil separator,
- oil & fire fighting water recovery pit,
- mechanical systems network,
- electrical systems network,
- pipe rack,
- work shop
YANBU MEDINA DESALINATION PLANT

COUNTRY: Saudi Arabia

COMPLETION YEAR: 2006

CLIENT: Ansaldo

CONSULTING ENGINEER: Ministry of Energy Saudi Arabia

TYPE OF CONTRACT: Diagnostic Analysis, Concrete Repairing, Site Supervision, Topographic Check and Civil Design of Steam Turbine Pedestal

POWER PLANT CHARACTERISTICS: 45 MW Power Output based on Ansaldo Steam Turbines.

DESCRIPTION OF WORK
Site Supervision and Assistance
Diagnostic Survey for Existing Concrete Structure
Topographic Check of New Sections

We provided the following material analysis:
SITE TESTS and LABORATORY TESTS AND ANALYSIS
1. micro seismic surveys with ultrasounds (UNI 9524-89);
2. defractometry analysis (XRD);
3. physical tests made on the concrete samples to give an estimate of the compressive strength;
4. determination of Sclerometric index (UNI EN 12504-2: 2001);
5. standard practice for Petrography Examination of Hardened Concrete (ASTMc/856/02);
6. water soluble salts determination (UNI 11087);
7. determination of frameworks position with relevant diameter valuation of the steel bars by pacometer BS 1881;
8. determination of the carbonation depth (UNI 994-92);
9. technical report.
ELYO POWER PLANT STEAM TURBINE FOUNDATION

COUNTRY: France

COMPLETION YEAR: 2006

CLIENT: Fincantieri

CONSULTING ENGINEER: Evergreen

TYPE OF CONTRACT: New Steam Turbo Generator Pedestal Civil Design

POWER PLANT CHARACTERISTICS: 12 MW Power Output based on Fincantieri Steam Turbines.

DESCRIPTION OF WORK
Steam Turbine Foundation Design
Calculation Report: Static and Dynamic Analysis for Concrete Foundation.
Drawings: Formworks, Steel Reinforcement, Bar Bending Schedule of G/T Foundation.

STRUCTURE DESCRIPTION
A reinforced concrete plate constitutes the structure of gas turbine foundation with different thickness directly placed on soil.
PITHIVIERS 4970 KW TURBOGENERATOR FOUNDATION

COUNTRY: France

COMPLETION YEAR: 2006

CLIENT: Fincantieri

CONSULTING ENGINEER: Inova France S.p.A.

TYPE OF CONTRACT: Civil Design of Steam Turbo Generator Pedestal

POWER PLANT CHARACTERISTICS: 4,9 MW Power Output based on Fincantieri Steam Turbine.

DESCRIPTION OF WORK
Steam Turbine Foundation Design
Calculation Report: Dynamic and Static Analysis.
Drawings: Formworks, Steel Reinforcement, Bar Bending Schedule of G/T Foundation.

STRUCTURE DESCRIPTION
An asymmetrical reinforced concrete plate with different thickness directly placed on soil constitutes the structure of the steam turbine foundation.
COUNTRY: Italy

COMPLETION YEAR: 2006

CLIENT: Ansaldo

CONSULTING ENGINEER: Tirreno Power

TYPE OF CONTRACT: Civil Design of 2 New Gas Turbine Foundations, 1 Steam Turbo Generator Foundation and Balance of Plant Foundations.

POWER PLANT CHARACTERISTICS: Combined Cycles Power Plant based on 2x240 MW Ansaldo Gas Turbines, Plus A 320 MW.

DESCRIPTION OF WORK
2 Gas Turbine Foundation Design
Calculation Report: Static and Dynamic Analysis for 2 Concrete Foundations. Drawings: Piles Layout and Dimensioning, Formworks, Steel Reinforcement, Bars Bending Schedule of G/T Foundation.

STRUCTURE DESCRIPTION
A reinforced concrete plate constitutes the structure of gas turbine foundations with different thickness, directly based on 37 Φ 800 mm piles.
NAPOLI POWER PLANT GAS TURBINE FOUNDATION

COUNTRY: Italy

COMPLETION YEAR: 2005

CLIENT: Ansaldo

CONSULTING ENGINEER: Tirreno Power

TYPE OF CONTRACT: Diagnostic Analysis, Concrete Repairing and Civil Design of Steam Turbine Pedestal

POWER PLANT CHARACTERISTICS: Combined Cycles Power Plant based on 2x240 MW Ansaldo Steam Turbines, Plus A 320 MW.

DESCRIPTION OF WORK
Turbine-alternator replacement with partial demolition of the foundation (3,6x4 m opening in the existing central septum, demolitions of 3 operating floor beams and upper parts of central septum and 4 columns), modifications of existing columns and beams sections, new concrete sections to substitute the demolished ones.
Verification of existing steam turbo generator foundation, including repairing and design replacing steam turbine-alternator.
New anchors position study: partial use of existing ones and new locations through concrete section modifications.
Calculation Report: Static and Dynamic Analysis.
Drawings: Demolition, Repair and Reconstruction Details, Carbon Fibre Reinforcement Details, Formworks, Steel Reinforcement, Bar Bending Schedule, Diagnostic Survey for Existing Concrete Structure.
MISR EDFU WRITING AND PRINTING PAPER CO POWER PLANT

COUNTRY: Egypt

COMPLETION YEAR: 2005 - 2006

CLIENT: Fincantieri

CONSULTING ENGINEER: MIRS - EDFU Writing And Printing Paper Co

TYPE OF CONTRACT: Diagnostic Analysis, Concrete Repairing and Civil Design of Steam Turbine Pedestal

POWER PLANT CHARACTERISTICS: 8 MW Power Output based on Fincantieri Steam Turbines

DESCRIPTION OF WORK
Replacement of Existing Steam Turbine-Alternator with a New Fincantieri One modifying the Existing Foundation.
Verification of Existing Steam Turbo Generator Foundation and Design of necessary Sections Modifications to house new machines.
Concrete Demolitions, Sections Enlargements Repairing.
Calculation Report: Static & Dynamic Analysis.
Drawings: Demolition, Repair and Reconstruction Details, Carbon Fibre Reinforcement Details, Formworks, Steel Reinforcement, Bar Bending Schedule, Diagnostic Survey for Existing Concrete Structure.

STRUCTURE DESCRIPTION
The structure of the steam turbine foundation is constituted by a mat foundation from which six columns carry the operation floor and the mezzanine floor: the two columns under the generator have been enlarged in dimension due to the loads increase given by new machine.
COUNTRY: Italy

COMPLETION YEAR: 2005

CLIENT: Ansaldo

CONSULTING ENGINEER: FATA EPC

TYPE OF CONTRACT: Civil Design of Gas Turbines Foundation and Condenser Foundations

POWER PLANT CHARACTERISTICS: Combined Cycle Power Plant Power Output based on 240 MW Ansaldo Gas Turbine, plus 380 MW Steam Turbines

DESCRIPTION OF WORK
Gas Turbine Foundation Design
Calculation Report: Static and Dynamic Analysis for Concrete Foundation.
Drawings: Formworks, Steel Reinforcement, Bar Bending Schedule of G/T Foundation.

STRUCTURE DESCRIPTION
A reinforced concrete plate constitutes the structure of Gas Turbine foundation with different thickness directly placed on soil.
COUNTRY: Italy

COMPLETION YEAR: 2005

CLIENT: Ansaldo

CONSULTING ENGINEER: FATA EPC

TYPE OF CONTRACT: Civil Design of Steam Turbines Pedestal


DESCRIPTION OF WORK
Steam Turbine Foundation Design
Calculation Report: Static and Dynamic Analysis.
Drawings: Formworks, Steel Reinforcement, Bar Bending Schedule Inserts, Anchors Bolts and Embedded Items Details.

STRUCTURE DESCRIPTION
The structure of the steam turbine foundation is constituted by a mat foundation from which ten columns carry the operation floor and the mezzanine floor.
VADO LIGURE COMBINED CYCLE STEAM TURBINE FOUNDATION

COUNTRY: Italy

COMPLETION YEAR: 2005

CLIENT: Ansaldo

CONSULTING ENGINEER: Tirreno Power

TYPE OF CONTRACT: Civil Design of Steam Turbine Pedestal

POWER PLANT CHARACTERISTICS: Combined Cycle Power Plant based on 2x240 MW Ansaldo Gas Turbine and 380 MW Steam Turbines.

DESCRIPTION OF WORK

We provided the following material analysis:
SITE TESTS AND LABORATORY TESTS AND ANALYSIS
1. micro Seismic surveys with ultrasounds (UNI 9524-89);
2. Defractometry analysis (XRD);
3. physical tests made on the concrete samples to gives an estimate of the compressive strength;
4. determination of Sclerometric Index (UNI EN 12504-2: 2001);
5. standard practice for Petrography Examination of Hardened Concrete (ASTMc/856/02);
6. water soluble salts determination (UNI 11087);
7. determination of frameworks position with relevant diameter valuation of the steel bars by pacometer BS 1881;
8. determination of the carbonation depth (UNI 994-92);
9. technical report.
COUNTRY: Italy

COMPLETION YEAR: 2005

CLIENT: Ansaldo

CONSULTING ENGINEER: Tirreno Power

TYPE OF CONTRACT: Civil Design of 2 New Gas Turbine Foundations

POWER PLANT CHARACTERISTICS: Combined Cycle Power Plant based on 2x240 MW Ansaldo Gas Turbine and 380 MW Steam Turbines.

DESCRIPTION OF WORK
Gas Turbine Foundations Design.
Calculation Report: Static and Dynamic Analysis for Concrete Foundations.
Drawings: Formworks, Steel Reinforcement, Bar Bending Schedule of G/T Foundation.

STRUCTURE DESCRIPTION
A reinforced concrete plate constitutes the structure of gas turbine foundation with different thickness directly placed on soil.
**COUNTRY:** Italy  
**COMPLETION YEAR:** 2005  
**CLIENT:** Finacantieri  
**CONSULTING ENGINEER:** Energy Recuperator S.r.l.  
**TYPE OF CONTRACT:** Civil Design of new 6 MW Steam Turbo Generator Pedestal  
**POWER PLANT CHARACTERISTICS:** 6 MW Power Output based on Fincantieri Steam Turbine.  

**DESCRIPTION OF WORK**  
Steam Turbine Foundation Design.  
Drawings: Formworks, Steel Reinforcement, Bar Bending Schedule of G/T Foundation  

**STRUCTURE DESCRIPTION**  
The structure of the steam turbine foundation is constituted by a mat foundation from which six columns carry the operation floor with different thickness and a central opening to house the condenser. The six columns are basically symmetrically placed along longitudinal axis of foundation.
SELLERO COGENERATION POWER PLANT

COUNTRY: Italy

COMPLETION YEAR: 2004

CLIENT: Finacantieri

CONSULTING ENGINEER: Energy Recuperator S.r.l.

TYPE OF CONTRACT: Civil Design of Steam Turbo Generator Pedestal and Verification of Existing Structure

POWER PLANT CHARACTERISTICS: 6 MW Power Output based on new Fincantieri Steam Turbine.

DESCRIPTION OF WORK
Concrete sections modifications (demolitions and enlargement) because of steam turbine - alternator replacement (due to the rupture of old machine).
Drawings: Demolition, Repair and Reconstruction Details, Carbon Fiber Reinforcement Details, Formworks, Steel Reinforcement, Bars Bending Schedule, Diagnostic Survey for Existing Concrete Structure.

STRUCTURE DESCRIPTION
The structure of the steam turbine foundation is constituted by a mat foundation from which 4 columns and a central septum carry the operation floor.
COUNTRY: Morocco

COMPLETION YEAR: 2004

CLIENT: Finacantieri

CONSULTING ENGINEER: Consumar Sugar Factory

TYPE OF CONTRACT: Civil Design and Technical Assistance of New Steam Turbo Generator Pedestal

POWER PLANT CHARACTERISTICS: 12 MW Power Output based on Fincantieri Steam Turbines.

DESCRIPTION OF WORK
AL RAQQA SUGAR COMPANY

COUNTRY: Syria

COMPLETION YEAR: 2003

CLIENT: Finacantieri

CONSULTING ENGINEER: Al Raqqa Sugar Company

TYPE OF CONTRACT: Civil Design and Technical Assistance of New Steam Turbo Generator Pedestal

POWER PLANT CHARACTERISTICS: 8 MW Power Output based on Fincantieri Steam Turbine

DESCRIPTION OF WORK
Steam Turbine Foundation Design.
Calculation Report: Dynamic and Static Analysis for the Steam Turbine Foundation of Al Raqqa Plant.
Drawings: Formworks, Steel Reinforcement, Bar Bending Schedule.

STRUCTURE DESCRIPTION
The structure of the steam turbine foundation is constituted by a mat foundation from which six columns carry the operation floor.

![Diagram of steam turbine foundation](image-url)
CHIVASSO POWER PLANT: TRANSFORMATION IN COMBINED CYCLE

COUNTRY: Italy

COMPLETION YEAR: 2003

CLIENT: Enel Power

CONSULTING ENGINEER: Enel Power

TYPE OF CONTRACT: Design and Technical Assistance of all the Civil Structures Inside the Chivasso Power Plant, in particular Demolition and Reconstruction of an Existing Steam Turbine Concrete Foundation and 1 New Foundation.

POWER PLANT CHARACTERISTICS: 250 MW Power Output based on Ansaldo and General Electric Steam Turbines.

DESCRIPTION OF WORK
Steam Turbine Foundation Design.
Calculation Report: Dynamic and Static Analysis for the Steam Turbine Foundation of Chivasso Plant.
Drawings: Formworks, Steel Reinforcement, Bar Bending Schedule.

STRUCTURE DESCRIPTION
Both the structures are constituted by a mat foundation from which 8 columns carry the operation floor.
**COUNTRY:** Iran

**COMPLETION YEAR:** 2002

**CLIENT:** Fincantieri

**CONSULTING ENGINEER:** Behshahr Industries Company

**TYPE OF CONTRACT:** Civil Design and Technical Assistance of New Steam Turbo Generator Pedestal

**POWER PLANT CHARACTERISTICS:** 3 MW Power Output based on Fincantieri Steam Turbines.

**DESCRIPTION OF WORK**
Steam Turbine Foundation Design.
Calculation Report: Dynamic and Static Analysis for the Steam Turbine Foundation.
Drawings: Formworks, Steel Reinforcement, Bar Bending Schedule.

**STRUCTURE DESCRIPTION**
The structure of the steam turbine foundation is constituted by a mat foundation from which six columns carry the operation floor with different thickness.

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COUNTRY: Oman

COMPLETION YEAR: 2001

CLIENT: Ansaldo

CONSULTING ENGINEER: Hitachi / Enel Power

TYPE OF CONTRACT: Civil Design of New Gas Turbine Foundation

POWER PLANT CHARACTERISTICS: 120 MW Power Output based on Ansaldo Gas Turbine.

DESCRIPTION OF WORK
Gas Turbine Foundation Design.
Calculation Report: Pile Dimensioning, Static and Dynamic Analysis for Concrete Foundation.
Drawings: Piles Layout and Verification, Formworks, Steel Reinforcement, Bars Bending Schedule of G/T Foundation.

STRUCTURE DESCRIPTION
A reinforced concrete plate constitutes the structure of gas turbine foundation with different thickness directly placed on 39 piles.
COUNTRY: Oman

COMPLETION YEAR: 2001

CLIENT: Ansaldo

CONSULTING ENGINEER: AES Barka S.A.O.C.

TYPE OF CONTRACT: Civil Design of New Steam Turbine Foundation

POWER PLANT CHARACTERISTICS: 65 MW Power Output based on Ansaldo Steam Turbines.

DESCRIPTION OF WORK
Steam Turbine Foundation Design.
Calculation Report: Static and Dynamic Analysis for Concrete Foundation.
Drawings: Formworks, Steel Reinforcement, Bars Bending Schedule of G/T Foundation.

STRUCTURE DESCRIPTION
A reinforced concrete plate constitutes the structure of steam turbine foundation with different thickness, directly based on soil at variable level.