

RADYAS
Engineered Solutions



History

Radyab Company, established in 1980 and officially registered in 1983. This company is expertized in the field seismic upgrade and strengthening of buildings. It is widely known for being a pioneer in Iran for the application of Fiber Reinforced Polymer (FRP) materials for retrofitting existing structures and application of GFRP re-bars in new structures. Radyab Company Also co-operates with the Structural Department of Empa Research Institute in Switzerland and was a member of the technical committee for editing FRP Design Manual.



Masoud Motavalli
Member of board of directors



Javad Najafi
Managing Director



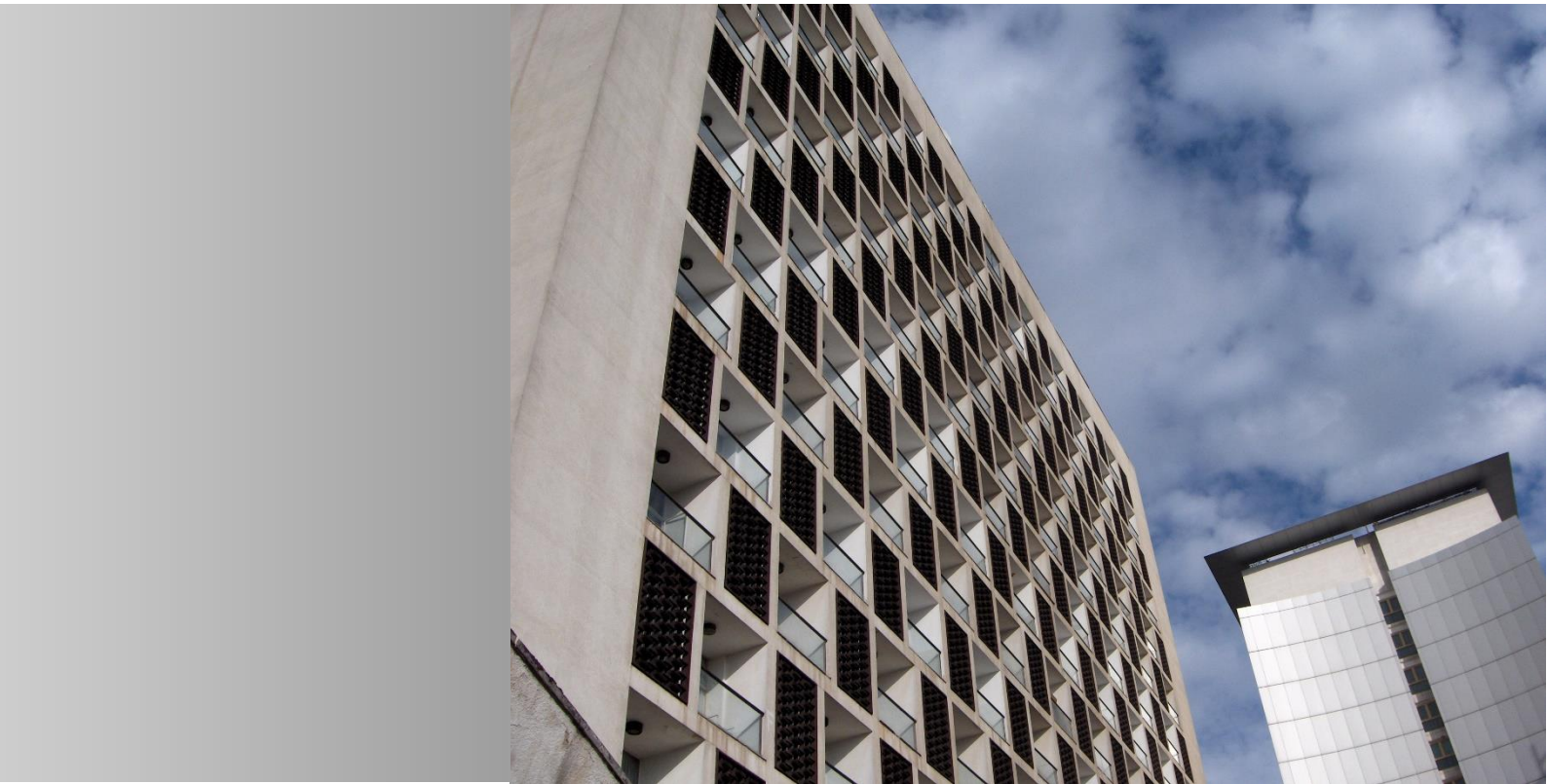
Sasan Mohaseb
Member of board of directors

Since its inception, Radyab has endeavored to maintain a reputation for excellence in performance by providing a high quality services, based on technical competence, efficiency, cost effectiveness and adherence to contract programs. Thanks to our timely shifts in strategy and a major restructuring plan designed to create more flexible organization, we have been able to make tough decisions quickly, shifting resources to match opportunities, reducing and reallocating overhead and investing more in people and processes that ensure our continued success.



SERVICES: Our List of services

- Design and consulting for retrofitting existing buildings
- Application of FRP in retrofitting existing buildings
- In-situ and laboratory tests for quality control of FRP systems
- Design, consulting and sale of GFRP re-bars
- Structural analysis and assessment
- Steel and Concrete Jacketing
- Repair of Concrete Structures
- Anchor Bolt and Rebar Installation
- Conducting Technical Seminars in the field of Seismic Retrofitting



Project: Azadi Grand Hotel Tehran, Seismic Rehabilitation Design and Supervision. Tehran, Iran 2004 – 2010

Azadi Grand Hotel, a 28 story 40-year-old RC building with total area of 50 000 m², has 500 guest rooms. Seismic rehabilitation evaluation and ` is done in joint cooperation by **SMTeam GmbH** of Switzerland and **Radyab Co.** of Iran (in 2004) and then supervised during construction (2007–2010). The seismic design includes installing Hydraulic Dampers within steel bracings and column wrapping by CFRP composites. CFRP quality tests and application supervision is done by **EMPA** (Switzerland).



Azadi Grand Hotel, 2007



Azadi Grand Hotel, 2010



Site visit by Prof. Motavalli of EMPA - 12/10/2007 and Dr. Mohaseb of SMteam.
Mr. Javad Najafi of Radyab Co. is giving details on structural deficits (12/07/2007).



Prototype RC column to simulate Azadi Grand Hotel rectangular RC columns under cyclic earthquake load prior to design phase. Empa structural labs, Zurich, Switzerland 02/22/2005



Test results shows compression rebars buckling under bending loads. Empa structural labs, Zurich, Switzerland 07/20/2005



Three different prototype RC columns under cyclic earthquake load prior to design phase. Empa structural labs, Zurich, Switzerland 09/20/2006



Mr. **Javad Najafi** of Radyab Co. (right) visiting results of the dynamic test on three different prototype RC columns together with **professor Motavalli**. EMPA structural labs, Zurich, Switzerland 09/20/2006



International technical meeting at Radyab project site office. Dr. Christoph Czarerski of EMPA Switzerland (left), Mr. Li Yang of CATIC Shanghai and Dr. Mohaseb of SMTeam GmbH (middle) and Mr. Javad Najafi (right). Tehran, Iran 04/14/2008



Pull off test to be carried out by Dr. Chrostoph Czaderski of Empa (middle), Mr. Javad Najafi (left). Tehran, Azadi Grand Hotel, 04/15/2008



Azadi Grand Hotel Lobby before starting the refurbishment project. Tehran, 2005



Azadi Grand Hotel Lobby. Main RC columns at the middle of the lobby are wrapped by Carbon fiber CFRP composites. Tehran 04/15/2008



Interior RC columns are strengthened by Carbon Fiber CFRP Composite. 04/15/2008



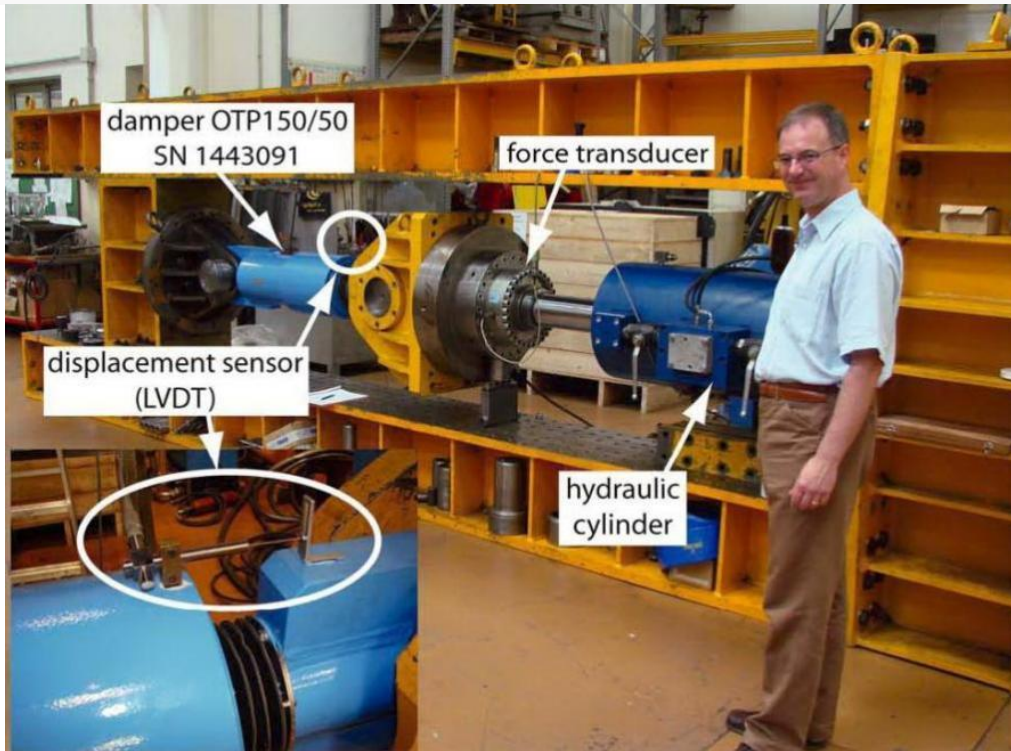
Exterior columns are strengthened by Carbon Fiber CFRP Composite. 04/15/2008



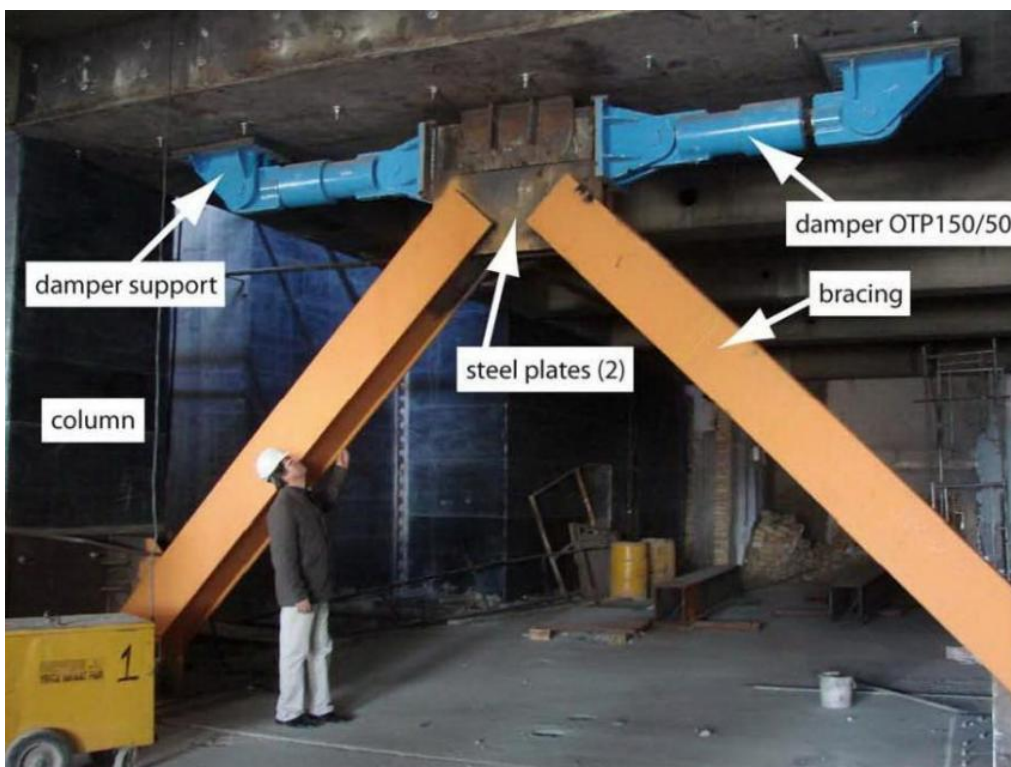
Hydraulic Dampers are ready to be shipped to Azadi Grand Hotel project in Tehran. FIP Industriale, Padova, Italy 07/03/2008



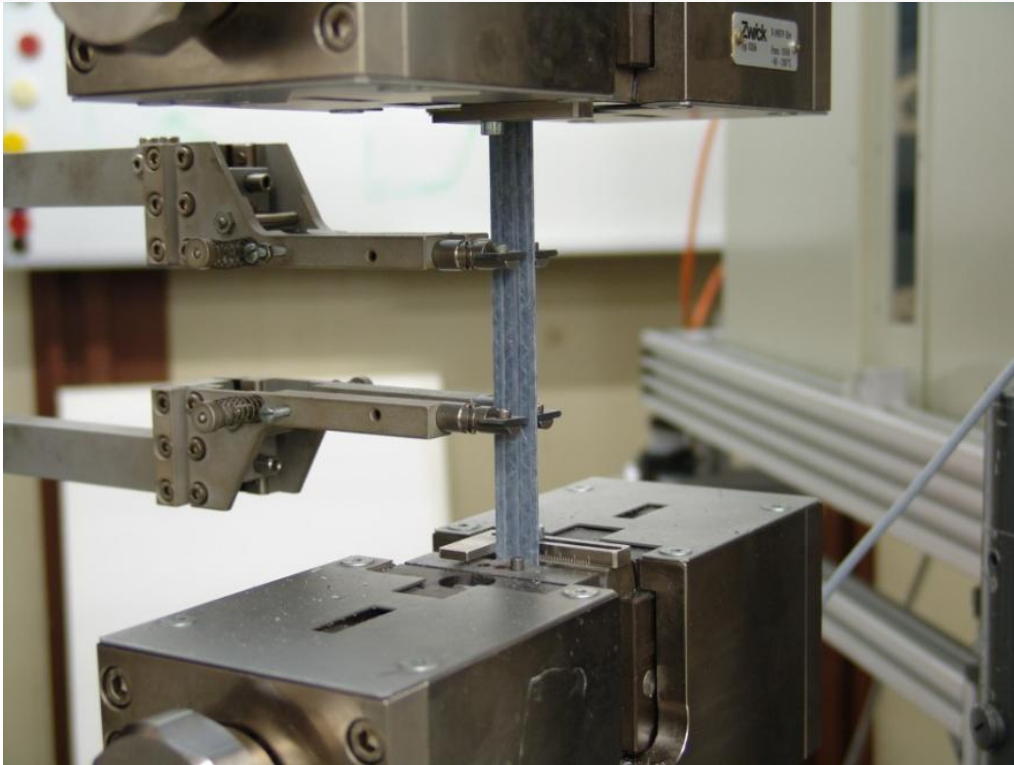
One of the hydraulic Dampers installed in the test setup to measure the technical characteristics under supervision of Swiss Federal Institute EMPA expert Dr. Felix Weber. FIP Industriale, Padova, Italy 07/03/2008



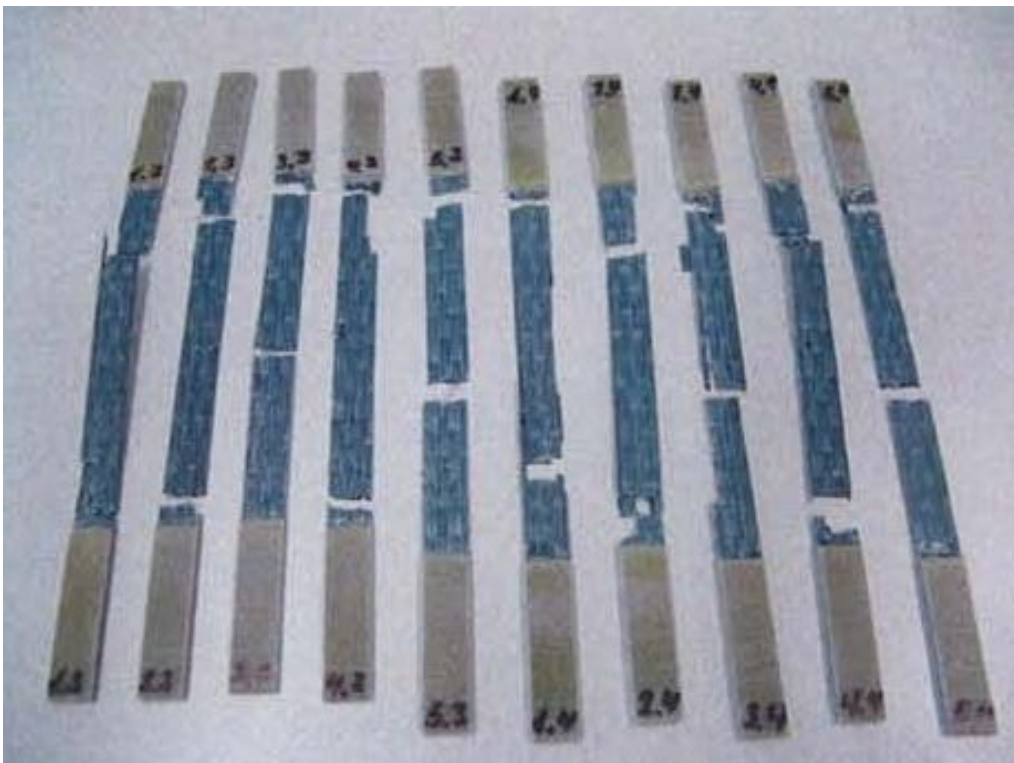
The hydraulic Damper installed in the test setup to be tested by Dr. Samuel Infanti of FIP Industriale under supervision of Swiss Federal Institute Empa expert Dr. Felix Weber. FIP Industriale, Padova, Italy 07/03/2008



Hydraulic Dampers are installed in combination with the steel bracings. Mr. Javad Najafi is visiting installation of the energy damping system .Tehran, Iran 12/08/2008



Carbon Fiber CFRP Composite samples under tensile test to determine tensile characteristics such as ultimate tensile strength and tensile elasticity modulus. Empa structural labs, Zurich, Switzerland 09/08/2008



Carbon Fiber CFRP Composite samples after tensile test to determine tensile characteristics such as ultimate tensile strength and tensile elasticity modulus. Empa structural labs, Zurich, Switzerland 09/08/2008

Project: Dr. Shariati Museum Seismic Rehabilitation. Tehran, Iran, 2005 – 2006

Shariati Museum is the first masonry building strengthened by Carbon Fiber (CFRP) composites in Iran. Engineering and design was carried out by **SMTeam GmbH** of Switzerland. Supervision was done by Swiss Federal Institute of **Empa**.



Radyab staff applying high strength repair mortar as substrate for CFRP stripes on the masonry walls. Shariati Museum, Tehran, Iran, 10/05/2005



Radyab Co. staff applying CFRP stripes on the masonry walls. Shariati Museum, Tehran, Iran, 10/05/2005



Professor Urs Meier (left), Vice President of Empa (Switzerland) visiting application of Carbon Fiber stripes in Shariati Museum retrofitting project, discussing technical issues to Mr. Javad Najafi (right). Shariati Museum, Tehran, Iran 01/06/2006



Shariati Museum entrance at the end of retrofitting project. Dr. Ali Shariati Statue is located at the entrance. Shariati Museum, Tehran, Iran, 05/24/2006

Project: Seismic Evaluation of Swiss Embassy and Swiss Residence buildings in Tehran, Iran. 2006

Swiss Embassy building is a 35-year-old masonry building and Swiss Ambassador Residence is a 50-year-old one, both located in north of Tehran close to a big fault. Seismic evaluation and design by **WEBER & BROENNIMANN** engineering Co. (Switzerland). Local technical services and material tests were conducted by **Radyab Co.**, Iran.



Swiss Embassy, Tehran. Mr. Javad Najafi and Mr. Broennimann are standing in front of the main building. 07/11/2006



Technical meeting in Zurich to discuss technical issues with the experts. From left to right: Dr. Cherstin Pfyl, Professor Motavalli, Mr. Javad Najafi, Mr. Sven Heunert, Mr. Hans Broennimann. Empa, Zurich, Switzerland 09/25/2006.



Technical meeting in Swiss Ambassador's residence to discuss technical issues with the experts. Mr. Sven Heunert (middle), Mr. Javad Najafi (right). Tehran, Iran 09/18/2006



Compression test to be carried out on a masonry wall specimen taken out of load bearing walls in Swiss Embassy Building. Supervisor: Mr. Sven Heunert. Amirkabir University, Tehran 06/16/2006



Technical NDT investigations by Radyab Co. supervised by Mr. Sven Heunert and Mr. Javad Najafi. Swiss Ambassador Residence, Tehran, Iran 09/18/2006

Projects

Project: Seismic Rehabilitation of Esteghlal Hotel Tehran (west and east towers). 2006

Seismic evaluation and rehabilitation design is done by **SMTeam GmbH** (Switzerland) in joint cooperation with **Radyab Co.** Tehran, Iran, 2005.



With a total area of 48000 m², west tower (right in the picture) is a 45-year-old steel structure and the east tower is a 35-year-old reinforced concrete structure.



Non Destructive Tests (left) and Destructive Tests (right) to evaluate the existing structure. Radyab Co., Esteghlal Hotel, Tehran, Iran 09/20/2005



Non Destructive Tests to evaluate the existing structure. Left picture: Locating the rebars in the building foundation. Right picture: Determining concrete compressive strength by means of Schmidt Hammer. Esteghlal Hotel, Tehran, Iran 07/14/2005



Destructive Tests (concrete core) on the RC beams to evaluate the existing structure material properties. Radyab Co., Esteghlal Hotel, Tehran, Iran 11/02/2005



As Built 3D Structural Model of the building based on the detailed study is provided for Dynamic Analysis of the building in ADINA program. Radyab Co. Tehran, 2005



As Built 3D Structural Model of the building based on the detailed study is provided for Dynamic Analysis of the building in ADINA program. Radyab Co. Tehran, 2005

Projects

Project: Shahid Mohammadi Hospital Seismic Rehabilitation Design. Bandar Abbas, Iran. 2005 – 2006

It is a 6 story RC building with area of 15 000 M2 in Bandar Abbas city, located in north coast of Persian Gulf. The project is seismic evaluation and design of the existing building in cooperation with the renovation consultant, Iran Arch consulting engineers of Iran. The retrofitting design includes column wrapping by FRP composites as well as RC shear walls. Retrofitting execution is being done while some parts of the hospital are under service.



The two upper stories are to be refurbished and renovated while the other floors are operational. Bandar Abbas, Iran 11/09/2005



Non Destructive Tests to evaluate the existing structure. Staffs locating the rebars in the structural elements. Bandar Abbas, Iran 10/08/2005



Non Destructive Tests to evaluate the existing structure. Determining concrete compressive strength by means of SCHMIDT Hammer. Bandar Abbas, Iran.08/03/2005



Non Destructive Tests to evaluate the existing structure. Ultrasound Wave Transducer to determine concrete consistency (left). Locating the rebars in the building structural elements by Rebar Locator (right). Bandar Abbas, Iran 06/28/05



Destructive and Non Destructive Tests are done even in the running parts of the Hospital. Mohammadi Hospital, Bandar Abbas, Iran 06/20/2005



Implanting rebars in the floor decks to establish new RC concrete shear walls to resist earthquake lateral force. Mohammadi Hospital, Bandar Abbas, Iran 04/16/06



Implanting rebars in the decks and walls to establish new RC concrete shear walls to resist earthquake lateral force. Mohammadi Hospital, Bandar Abbas, Iran 04/20/06



Implanting rebars in the elevator walls to establish new RC concrete shear walls to resist earthquake lateral force. Mohammadi Hospital, Bandar Abbas, Iran 04/18/06



New reinforcement builds up on the implanted rebars to establish new RC concrete shear walls. Mohammadi Hospital, Bandar Abbas, Iran 04/18/2006

Project: Seismic Rehabilitation of US interest section in Iran, Swiss Embassy, Tehran, Iran 2008/2009

US Interest section in Iran building is a 50 year old masonry building in north of Tehran. Seismic Rehabilitation Design and construction is done by **Radyab Co.** under Supervision of **Empa** (Switzerland).



US Interest Section in Iran, Tehran, Iran 01/15/2008



Professor Motavalli (Empa) checking the Masonry Shear Test setup (left) and discussing the structural details with Radyab Co. staff (right). Tehran, Iran 05/12/08



DT Tests (Concrete Core) to check the shear walls concrete quality. Tehran, 12/03/2008



Compressive tests to check the shear walls concrete quality. Tehran, 12/24/2008



GFRP Composite Bracings to protect the masonry walls from out of plane bending. Tehran 10/19/2008



Steel Bracings provided to improve the floor deck's consistency. Tehran, Iran 06/13/2008

Project: Seismic Rehabilitation Design and Construction of Diamond of Persia Shopping Center. Tehran, Iran 2007 – 2009

A 7 story 25-year-old official building in total area of 25 000 m² is intended to function as a shopping center. Reinforced concrete structure of the building should be upgraded to stand the increased loading due to new occupational purpose. In addition, Seismic Rehabilitation Evaluation and Design is required regarding Seismic Code changes in the past 25 years. Seismic Rehabilitation Design and Construction is done by Radyab Co. Iran.



The entrance of the Diamond of Persia shopping center. Tehran, Iran 09/04/2009



Mr. Javad Najafi (left) together with Radyab Engineering team (right) discussing the technical details to the Client Mr. Mohamadi Baaher (middle). Tehran 2007



Radyab staff determining the rebars inside the RC columns by means of Rebar Locator Scanners in Structural Evaluation phase. Tehran, Iran 11/16/2007



Radyab staff grinding the surface of the RC columns to prepare them for retrofitting by wrapping CFRP fabrics. Mr. Javad Najafi (middle) is supervising. Tehran, Iran 11/06/2007



**CFRP Carbon Fiber Sheets are applied on the RC beams to upgrade their Shear Stress capacity.
Tehran, Iran 07/16/2008**



Shear strengthening of the RC beams is completed. Tehran, Iran 07/16/2008



All of the old RC columns are strengthened by CFRP Carbon Fiber column wrapping method in the above pictures. Tehran, Iran 11/06/2007



Above Pictures: Interior and exterior views of the shopping center. Tehran, Iran 09/04/2009

Projects

Project: Seismic Evaluation and Rehabilitation Design of Kerman Province Important Buildings. Kerman, Iran 2008 – 2010

Funded by a **World Bank** loan, 29 important buildings of Kerman Province are chosen by Kerman Governorate to be rehabilitated. List of the buildings includes the Hospitals, Fire Stations, Telecommunication Centers, Administrative Buildings, etc.

Project includes Seismic Evaluation, design and construction Supervision of the Buildings as well as training courses for local engineers. **DRM** (Disaster Risk Management) of Switzerland is the main Consultant and **Radyab Co.** is the local Engineering partner.



Governorate of Kerman, a 150-year-old building, site visit by Mr. Javad Najafi and Dr. Jurg Hammer (right), managing director of DRM, Kerman, Iran 05/27/08



Site visit of Bahonar hospital by Dr. Jost Studer (left) and Dr. Jurg Hammer of DRM and site visit of Kerman old Bazar together with Mr. Javad Najafi. Kerman, Iran 07/31/2008



Seismic Training Course by DRM and Radyab Co. for Kerman Province local structural engineers in frame work of World Bank loan to Kerman Province after Bam earthquake. Kerman, Iran 04/01/2009



Seismic Training Course for local structural engineers in frame work of World Bank loan to Kerman Province in Iran after Bam earthquake. From left to right: Dr. Jost Studer, Mr. Javad Najafi and Professor Thomas Wenk (Swiss representative in EURO CODE for Seismic Engineering). Kerman, Iran 04/01/2009

Project: Qomrud Bridge Structural Strengthening, Qom, Iran 2009 - 2010

Qomrud Bridge is a new RC bridge under construction with traffic passing under and over it. There is a design problem in beams reinforcement revealed during construction. **Hexa Engineering Co.** (Iran) is the designer and supervisor and Structural Strengthening is executed by **Radyab Co.**



CFRP Carbon Fiber stripes are installed under the RC beams to meet the local rebar overlap demand. Qom, Iran 10/18/2009



CFRP Carbon Fiber stripes are being applied under the RC beams using a high platform to allow the traffic pass underneath. Qom, Iran 01/28/2010



Radyab Staff is applying CFRP Carbon Fiber stripes under the RC. Qom, Iran



Two lateral CFRP Carbon Fiber stripes are applied under the RC beams to meet the local rebar overlap demand and the two additional stripes in the middle are to provide total consistency of the beam. Qom, Iran 01/28/2010



Traffic is running under the bridge during strengthening work. Qom, Iran 02/21/2010

Project: Khalij Fars Shopping Mall Structural Strengthening. Shiraz, Iran 2010

Khalij Fars shopping mall building with total area of 500 000 m² is the largest shopping centre in Iran. There are large openings in the 1st and 2nd floors to be covered, but the adjacent RC columns and beams should be strengthened first. Structural Strengthening Design and Construction is carried out by **Radyab Co.**



Main entrance of Khalij Fars shopping mall. Shiraz, Iran 02/02/2010



Dimensions of the building could be compared to the Lorries (more than 20) in front of the building waiting for unloading the construction material. Shiraz, Iran 02/02/2010



Columns and beams are being strengthened by Carbon Fiber CFRP Composites by Radyab Co., Khalij Fars shopping Mall, Shiraz, Iran 03/11/2010



A CFRP wrapped column and diagonal CFRP stripes on the concrete deck for bending strengthening of beams. Khalij Fars shopping Mall, Shiraz, Iran 04/19/2010

Projects

Project: Janbazan Bridge Structural retrofitting. Tabriz, Iran 2010

This is a RC bridge with RC beams and decks with traffic running under and over it. Some of the main beams are damaged due to a car crash. The project intends to repair the damaged beams with special materials and then replace the damaged steel rebars with CFRP sheets.



**Above and front pictures:
The RC bridge and some of
the damaged beams before
being repaired and
retrofitted**





The RC damaged beams are repaired and strengthened by CFRP sheets.



Projects

Project: Golestan Shopping Centre Seismic Retrofitting, Meshkinshahr, Ardebil, Iran 2010

According to new plans, some of the columns are omitted to develop a large open area and application of some other parts is changed, resulting in over load in some of the structural members (beams, columns, foundation, etc.). Structural Strengthening Design and Construction is done by Radyab Co.



Project site, entrance of the residential complex and the shopping center building.

Mr. Javad Najafi visiting the project.



Installation of space frame in Golestan Shopping Centre, Meshkinshahr, Ardebil, Iran.



Surrounding columns bending capacity is increased by Concrete Jacketing method. Golestan shopping center. Radyab Co., Meshkinshahr, Ardebil, Iran



Surrounding columns are drilled based on the structural strengthening design for implanting steel bars in Concrete Jacketing method.



**Above Pictures: CFRP Sheets are applied beneath the beams to increase their bending capacity.
Radyab Co., Meshkinshahr, Ardebil, Iran**

Project: Abaadeh Cement Factory: Abaadeh. Fars Province, Iran 2010 - 2011

Abaadeh Cement factory is a 35 years old RC structure. Rehabilitation was designed to upgrade the structural quality and durability of the concrete silos and the other industrial structures enabling them to work under service for more decades. CFRP sheets were externally applied to the silos in two perpendicular directions.



Abaadeh Cement Factory Silos, Abaadeh, Fars Province, Iran 2010 - 2011



Grinding the concrete surface as the first step of structural strengthening before repairing the concrete.



CFRP Sheets used for retrofitting the Abaadeh cement factory silos, Abaadeh, Fars Province, Iran 2010 - 2011

Project: Tehran Mosalla Seismic Structural Retrofitting. Tehran, Iran 2009 -2010

Tehran Mosalla (Praying place) has been under construction during last 25 years. Now, it is to be strengthened due to changes in seismic codes during that period. Design is done by University of Tehran, Faculty of Civil Engineering. Structural retrofitting design used in this project is mainly Steel Jacketing method for columns.



Above Pictures: Exterior and Interior view of the RC columns to be strengthened.



Above Pictures: Steel Jacketing starts with drilling holes to implant steel bolts inside them by means of special high strength Epoxy Resins.



Above Pictures: Implanting steel bolts by means of special high strength Epoxy Resins and then installing the steel sheets are the next steps in this method. Grout injection is the last step to be done after completion of steel sheets welded.

Project: Shiraz Metro (Subway) Station Structural Strengthening Project. Shiraz, Iran 2010

According to new loading plans, bending capacity of some of the RC beams and decks are to be increased. Structural strengthening design and construction is done by Radyab Co.



A beautiful view: CFRP Carbon Fiber Stripes are applied under the RC slabs to increase their flexural capacity. Ehsan Station, Shiraz Metro, Shiraz, Iran



**Grinding the concrete beam surface and substrate preparation before applying the CFRP Strips.
Ehsan Station, Shiraz Metro, Shiraz, Iran**



The main beams are strengthened by means of 5 high modulus Carbon Fiber Laminates of 10 Cm width and 1.4 mm thickness. Ehsan Station, Shiraz Metro, Shiraz, Iran

Project: Neka Wheat Silos Structural Repair Assessment, Design and Construction. Neka, Iran 2012

Neka wheat silos have been running for more than 30 years. Local damages and wide cracks have appeared in the concrete during recent years. In some places the cracks were very deep allowing water to leak inside the silo.

For retrofitting this structure, damaged concrete was removed, concrete surface was prepared by grinding, CFRP Laminates were applied along the crack length to compensate for the corroded steel bars, CFRP sheets were applied perpendicular to the crack direction to create integrity in the structure and the repaired area was then covered by paint.



Neka Wheat Silos consisting of 33 concrete silos of 50 meter height, Neka, Iran 2012



Horizontal crack is so deep to let rain fall penetrate inside the silo.



Close view of the crack shows depth of the crack and its porosity.



Above Pictures: Radyab Co. personnel are repairing the concrete substrate by means of grinding before the application of CFRP fabrics.



Radyab Co. personnel are repairing the horizontal cracks and replacing the corroded rebars with carbon fiber stripes (FRP). At the end, there is a carbon fiber fabric installed on repair area to maintain structural vertical consistency.



Four horizontal cracks are repaired and strengthened. Two others are opened and grinded before being repaired.

Project: Adineh Shopping Centre Structural Upgrading Construction. Tonekabon, Iran 2011 – 2012

Owner of Adineh shopping center is going to add an additional floor to the existing floors. Load bearing capacity of the existing structure should be upgraded due to the increasing loads. This is done by means of application of carbon fiber fabrics in column wrapping and shear strengthening of the beams.



Adine Shopping Centre under construction.



Radyab Co. personnel are grinding and then wrapping the columns with FRP composites.

Project: Seoul official building seismic Retrofitting Design and construction, Tehran, Iran 2011 - 2012

The official building located in Seoul St., Tehran has been designed and partially constructed about 10 years ago. The seismic design code has been revised after that time. New parts are constructed considering the recent codes but the existing parts should be retrofitted to overcome the load increase due to the new code.



Seoul official building under construction, Tehran, Iran.



Beams are strengthened for shear at the ends (supports).



Columns are strengthened for bending at their overall length.

Project: Kimiadaran Chemical Plant Seismic Rehabilitation Construction. Yazd, Iran 2012

Being established in recent years, Kimiadaran chemical company consulting engineer designed a retrofitting plan to upgrade seismic resistance capacity of the industrial structure using carbon fiber (FRP) stripes.



Kimiadaran Chemical Plant, Yazd, Iran.



Above Pictures: Installation of carbon fiber stripes on the RC beams and columns in Kimiadaran plant to upgrade load capacity of the structure.

Project: Ashrafi Office Building Structural Upgrading. Tehran, Iran 2012

Ashrafi office building contractor encountered problem of deflection in the floor decks during its construction. Carbon fiber strips are applied to control and limit the flexural deflections in both lateral axes.



Floor deck is lifted up to compensate the deflection by means of hydraulic jacks.



Carbon fiber strips are installed at the bottom side of the deck in X and Y axes.

Project: Sefidrud Dam Spillways Retrofitting. Manjil, Iran 2013



Projects

Project: Qeshm International Airport Control Tower Rehabilitation Design. Qeshm, Iran 2013

The Control Tower of Qeshm International Airport was affected by an earthquake, measuring around 5.0 on Richter scale, in year 2012. The steel structure forming the control room, which was mounted on the concrete tower structure, fell off during the earthquake. The concrete structure was also slightly damaged and cracks appeared in some parts. The control tower has been out of use ever since.

Seismic Evaluation and Performance Assessment was conducted on the tower. The final retrofitting design includes the use of FRP fabrics and laminated to retrofit the concrete beams and columns. A new control room was designed to be installed on the existing tower.



Qeshm International Airport Control Tower



Above Pictures: Damages to the Qeshm International Airport Control Tower due to 2012 earthquake



The control room was separated from the main structure due to earthquake

Project: Cinema Africa (Formerly Atlantic Cinema) Seismic Evaluation and Rehabilitation Design. Tehran, Iran 2013, Cinema Africa (Formerly known as Atlantic Cinema)

