



Gabriel Marchi Molina, PE

Project Engineer

Education

BS, Civil Engineering with
Structural Engineering
Concentration, Minor in
Mathematics, University of
North Carolina at Charlotte,
2006

Year Joined AMPHION

2012

Years of Experience

Since 2006

Professional Registrations

Professional Engineer – North
Carolina, Minnesota
NCEES Record Certificate

Additional Certifications

NDT Level II:
Magnetic Particle
Liquid Penetrant
Digital Ultrasonic Thickness

Additional Language

Proficiency

Portuguese

Mr. Gabriel Marchi Molina has been a Professional Engineer with Amphion Analytical Engineering, P.A. since 2012. Over the years, Mr. Molina has completed a wide variety of engineering and technical projects including mechanical integrity, finite element analysis (FEA), and structural engineering.

Mr. Molina has extensive experience in providing structural design for new or retrofit projects, structural analysis of existing components, finite element analysis (FEA), drafting and modeling, condition assessments, rehabilitation design for steel and concrete, construction and environmental management, and building envelope design. He specializes in 3-D modeling and FEA using SolidWorks and structural analysis using RISA 3-D.

Mr. Molina's experience in mechanical integrity include evaluations to determine conditions relating to the fitness of tanks, process vessels, pressure vessels, and piping including corrosion, material defects, and inadequate construction. He is also skilled in various nondestructive testing methods, including ultrasonic thickness testing, liquid penetrant, shear wave, vacuum box, and magnetic particle.

Mr. Molina is a licensed, professional engineer in North Carolina and Minnesota. He is also certified as an ASNT Level II Technician in magnetic particle testing (MT), liquid penetrant testing (PT), and ultrasonic thickness testing (UT) methods.

Mechanical Integrity

Pressure Vessels, Storage Tanks, Process Vessels, and Piping

Performed mechanical integrity inspections on storage tanks, process vessels, pressure vessels, and piping at numerous facilities covering a wide range of industries. This included performing the inspections themselves and project management over a team of inspectors. The industries covered include, but are not limited to, the tire and rubber industry, various chemical production industries, the paper industry, and soy bean processing industry. These inspections utilized various nondestructive testing (NDT) methods and failure analysis. In a number of instances, Mr. Molina directly maintained the clients' mechanical integrity program, including tracking inventory and scheduling inspections.

Performed engineering analyses under various guidelines, such as the American Petroleum Institute (API), American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, and The National Board Inspection Code (NBIC). Following field inspections, performed fitness-for-service (FFS) engineering analysis in accordance with the NBIC, API, and ASME, when applicable. Analyses included minimum required thickness, maximum allowable working pressure, corrosion rate and allowance calculations, as well as next inspection and expected life calculations. In addition, performed FFS evaluations based on stresses induced by vessel supports or penetrations, utilizing Zick's, Bijlaard's, or other appropriate methods. Designed and supervised a wide range of weld repairs for storage tanks, process vessels, and pressure vessels. This included coordination between repair contractors and plant personnel, and ensuring final approval by the Authorized Inspector (AI).

Finite Element Analysis (FEA)

Mold Cooling Rack Thermal Structural and Thermal Analysis

Time dependent thermal flow analysis of a mold cooling rack for use in a manufacturing facility. Mold cooling rack consisted of a frame of steel tubular members to support a 180,000 pound mold. Client requested results that would provide mold cooling data such as temperature profiles, time to cool the mold to a final temperature, and recommendations for improving cooling efficiency. Utilized SolidWorks for modeling and SolidWorks Flow Simulation add-on for completion of the analysis. Applied loading, boundary conditions, and appropriate meshing to perform the analysis.

3,700,000 Pound Forging Press Fixed Crosshead

Finite element analysis of a 3,700,000 pound forging press fixed crosshead to attempt to determine if the fixed crosshead is adequate for the external loading and stresses resulted from the operating stresses. Client requested for an analysis to determine if a modified design of the fixed crosshead is sufficiently designed. Utilized SolidWorks 2014 for modeling and SolidWorks Simulation add-on for completion of the analysis. Applied loading, boundary conditions, and appropriate meshing to perform the analysis.

Lifting Devices

Finite element analysis of various styles of lifting device and hooks for use in manufacturing facilities. Analysis was performed to determine the working load limit of an existing or new lifting device or to determine what modifications may be performed to increase the working load limit. The analysis utilized SolidWorks for modeling and SolidWorks Simulation add-on for completion of the analysis including application of loading, boundary conditions, and appropriate meshing to perform the analysis.

Pressure Vessels

Finite element analysis of ASME VIII Boiler and Pressure Vessel Code, Division 1 pressure vessels. Finite element analysis was performed to confirm the adequacy of the pressure vessel for the rated pressure and conformance of the code. The analysis utilized SolidWorks for modeling and SolidWorks Simulation add-on for completion of the analysis including application of loading, boundary conditions, and appropriate meshing to perform the analysis.

Bull Gear

Finite element analysis of bull gears to attempt to determine if the gears are adequate for the external loading and stresses resulted from the interference shrink fit of a shaft due to premature failure. The analysis utilized SolidWorks for modeling and SolidWorks Simulation add-on for completion of the analysis including application of loading, boundary conditions, and appropriate meshing to perform the analysis.

Equipment Support

Finite element analysis of equipment support for static and dynamic loading to determine if the support are adequate for the external loading and stresses. The analysis utilized SolidWorks for modeling and SolidWorks Simulation add-on for completion of the analysis including application of loading, boundary conditions, and appropriate meshing to perform the analysis.

Mill Roll

Finite element analysis of mill rolls for the manufacturing industry for static and dynamic loading to determine if the mill rolls are adequate for the external loading and stresses due to premature failure. The analysis utilized SolidWorks for modeling and SolidWorks Simulation add-on for completion of the analysis including application of loading, boundary conditions, and appropriate meshing to perform the analysis.

Manufacturing Equipment

Finite element analysis of manufacturing equipment for static loading to determine the stresses in the equipment due to external loading. The analysis utilized SolidWorks for modeling and SolidWorks Simulation add-on for completion of the analysis including application of loading, boundary conditions, and appropriate meshing to perform the analysis.

Product Storage Racks

Finite element analysis of product storage racks to determine a working load limit due to vertical and lateral loading. The analysis utilized SolidWorks for modeling and SolidWorks Simulation add-on for completion of the analysis including application of loading, boundary conditions, and appropriate meshing to perform the analysis.

Structural Engineering – New Design

Bridge Cranes and Monorails

The lead structural designer for multiple projects associated with the design of new bridge cranes and monorails for various manufacturing facilities with working load limits ranging from 1 ton to 50 tons.

Equipment Support and Walkway Platforms - Power

The lead structural designer for the design of new equipment support and elevated steel walkway platforms for various conditions at multiple power facilities.



Equipment Support and Walkway Platforms - Manufacturing

The lead structural designer for the design of new equipment support and elevated steel walkway platforms for a manufacturing facility.

Generator Foundation

The lead structural designer for the design of a cast-in-place concrete mat foundation for a 70,000 lb diesel generator.

Elevated Generator Platform

The lead structural designer for the design of an elevated generator platform and associated maintenance platform for a 70,000 lb diesel generator.

Parking Structure

The lead structural designer and draftsman for a three story 190 foot by 123 foot parking structure. The structure comprised of a system of pre-cast concrete columns, walls, and T-beams supporting topped pre-cast concrete double tees. The framing system was designed for vertical gravity loads including self-weight of the structure and live loads. Lateral wind and seismic loads are resisted by a system of pre-cast concrete wall shear panels. The topped pre-cast concrete double tees are designed to act as a horizontal diaphragm to transfer wind and seismic forces to the building's lateral restraint system. The deck was designed to transfer the shear load while concrete reinforcing steel in the deck perimeter will act as the diaphragm chord to transfer diaphragm forces to the lateral restraint system. The structure was designed utilizing a cast-in-place continuous wall footing and spread column footing foundation system. Continuous wall footings will support all pre-cast wall elements. Spread footings support the parking structure's columns. Footings were designed such that the maximum allowable footing pressure of 4000 psf is not exceeded.

The structure was designed according to the 2009 International Building Code and United Facilities Criteria (UFC) Structural Engineering requirements to resist the lateral forces due to wind and seismic, wind uplift forces, and dead plus live loads. The design drawings were completed using Autodesk Revit 2011, a Building Information Modeling (BIM) software. Completing the design drawings in BIM allowed advanced coordination with other disciplines and 3-dimensional models. Mr. Molina performed structural shop drawing reviews and addressed Request for Information (RFI)s.

Combat Communications Operations Facility

The lead structural designer and draftsman of the foundation, superstructure, and miscellaneous site structures for a new facility at Andersen Air Force Base in Guam. The structure was a single story steel and pre-cast concrete supported structure supported on cast-in-place continuous wall footings and isolated column footings. Miscellaneous site structures include an enclosed mechanical enclosure, trash enclosure, foundations for 20-foot tall light poles, and housekeeping pads. Guam is susceptible to typhoon wind velocities and very high seismic ground accelerations.

The structure was designed according to the 2009 International Building Code and United Facilities Criteria (UFC) Structural Engineering requirements to resist the lateral forces due to wind and seismic, wind uplift forces, and dead plus live loads.

The design drawings were completed using Autodesk Revit 2010, a Building Information Modeling (BIM) software. Completing the design drawings in BIM allowed advanced coordination with other disciplines and 3-dimensional models. Mr. Molina performed structural shop drawing reviews and addressed Request for Information (RFI)s.

Brotje Equipment Foundation Design

Part of a team that designed the foundation for a new piece of riveting equipment manufactured by Brotje Automation. The equipment was installed in an existing building adjacent to three other similar pieces of equipment. The 104 foot by 50 foot by 4.5 foot thick foundation was supported by 149 micropiles and contained several trenches and embedded plates to support the equipment and its accessories. The foundation was designed by utilizing both 2-dimensional and 3-dimensional software and hand calculations. The equipment manufacturer required strict design and construction standards which were coordinated during the design phase.

10-ton Bridge Crane Framing Design

Part of a team that designed the steel framing and foundation for a new 10-ton bridge crane which was installed in an existing building. The steel framing was designed by utilizing 3-dimensional software and hand calculations. A significant amount of coordination was required to ensure that the new steel framing would fit within the existing building's framing, lighting, and HVAC systems. The framing system was designed with moment frames, field bolted connections (to meet client requirements), and cables for lateral stability.

Gulf Intracoastal Waterway Western Closure Complex - 75' Sector Gate, Concrete Housing Structure, Closure Wall

Designed and detailed a new 75' steel sector gated structure to serve as flood protection in New Orleans. Project scope included the design of the temporary retaining structure (cofferdam system), the steel sector gate, concrete gate bay housing structure, base slab, pile foundation, needle girder system for dewatering, and the hinge and pintle support and operating system for the steel gate. The cofferdam system included a combination of an A-frame combi-wall system with internally braced sheet pile walls. Because the mechanical, electrical and hydraulics were performed by the USACE, extensive coordination with various USACE departments and disciplines was essential to the success of the project. A two-phase steel and concrete closure wall system was designed to provide flood protection across the channel as well.

Floating Sector Gate & Concrete Housing Structure

Designed and detailed flood gate system for a major waterway in New Orleans. Project scope included the design of the gate - a 258' long x 50' wide x 36' high steel structure, the steel piling support system, the concrete retaining wall pocket to house the gate, the needle beam closure system within the concrete, the

concrete guidewall retaining walls and the concrete sill along the channel bottom to contain the gate. The project included the coordination and design of hydraulic watering/dewatering conditions under various loading scenarios.

Veterinary Clinic

Assisted with the design-build of a one-story veterinary clinic in accordance to Unified Facilities Criteria and current International Building Code requirements. Responsibilities included full calculations and preparing a full set design documents with drawings and specifications during the design phase and review of shop drawings during construction. A 3-dimensional model was created of the structural portion using AutoDesk Revit Structures.

Temporary Bridge Foundation

Designed concrete foundations and assembled details for a temporary prefabricated steel bridge to cross over a trench and existing sewer lines.

Northwest Regional Water Reclamation Facility

Peer review of designed all concrete process structures and all masonry buildings for this new wastewater treatment plant. The process structures include: elevated Preliminary Treatment Headworks and Splitter Box, Membrane Aeration Basin with Pump Gallery, UV Disinfection, Equalization Pump Station, Effluent Pump Station, Blower Building, Maintenance Building, Control Lab Building, Influent Pump Station and miscellaneous site structures to include blower and equipment supports, retaining walls and sloping waterways.

S-44 and G-57 Gate Operator Replacement

Designed and detailed new steel gate operator platforms to replace existing platforms. Each of the platforms designed will accommodate new gate operating systems and configurations. Existing concrete supports were analyzed and modified as necessary for the applied loads. Access systems were designed and an existing precast building was analyzed for wind loading.

Goldsboro Water Treatment Plant

Structural condition assessment and analysis of the water treatment plant facility structures for preparing rehabilitation design documents. Comprehensive mapping of deficiencies, sampling and testing of concrete materials and documentation of reinforcement corrosion was completed. The structures included the rehabilitation of the rapid mix, flocculation, and sedimentation basins at the Goldsboro Water Treatment Plant (WTP); clearwell rehabilitation; replacement of chemical bulk storage tanks and rehabilitation to chemical areas; Waste Basin No. 3 evaluation and rehabilitation; WTP building repairs and rehabilitation; replacement of built-up roof on WTP; replacement of gas furnaces; replacement of potable water lines; pump at Harris Street elevated tank.

Reverse Osmosis Water Treatment Plant

A new water treatment facility for Currituck County was designed incorporating a pre-engineered metal building and specialty foundations. The foundation for this water treatment plant included depressed slabs, a concrete basement and pipe trenches specifically designed to meet the needs of the client. This project is currently under construction.

Water Treatment Plant

A new concrete water treatment plant for Caroline County was designed and redesigned to meet the client's needs. The original design was for 80-foot diameter concrete tanks. A later revision reduced the two concrete tanks to 40-foot diameter. This project is currently under construction.

Manufacturing Building

Mr. Molina assisted with the design of two concrete foundations for pre-engineered metal buildings (PEMB). One PEMB is a 12,000-square foot, 1-story dining hall and the other a 10,000- square foot, 1 story personal training compound.

The Cape Operations Building

Structural design of a concrete foundation for 3,750-square foot pre-engineered metal building (PEMB).

Parking Deck and Mail Operations Center

Structural design for a steel frame, 55,000-square foot mail processing center with 3 levels of parking for 650 cars above with capacity for a future a 30-car level expansion.

Structural Engineering – Analysis

Structural analysis of multiple above ground storage tanks (AST) in multiple client plant locations. Structural analysis was completed in order to verify that new openings in AST for the purpose of demolition would not cause a structural failure during demolition. Finite element analysis (FEA) was completed using RISA 3-D.

Fiberglass Dome FEA

Analyzed a fiberglass dome and bolt attachments for wind, dead, and live loads. Utilized RISA 3-D to complete finite element analysis (FEA).

Barracks

Utilized existing drawings to create a 3-dimensional structural model of an existing three story cast-in-place concrete building. Analyzed the structure in order to determine if it could support wind, seismic, and gravity loading conditions. Loading conditions were derived on the 2003 International Building Code. Separate models were built for each loading condition. RISA 3-D was utilized to analyze the structure.



Equipment Foundation

Structural evaluation, design, and construction inspection of concrete foundation repairs for a 108-ton boiler and 22-ton re-oxidation furnace, including temporary shoring of the tanks during construction.

Assisted with the structural foundation investigation and the foundation repair design for a waste heat recovery unit. Following the design, completed full-time onsite construction administration by maintaining the project schedule, logging daily events, answering daily contractor and client construction questions, and verifying that construction complies with plans and specifications.

Hotel Repair

Assisted with the design repair, jacking, and repair monitoring of a 16-story concrete structure, including the use of strain gages to measure the stresses of the repair design during jacking.

Structural Engineering – Condition Assessments

Refrigeration/Freezer Storage Buildings –

Various; North Carolina, Georgia, Alabama

Performed property condition assessments based on ASTM E2018-08 for thirteen individual refrigeration/freezer buildings.

Parking Structures

Performed structural and overall condition survey of five parking structures. Submitted report to client including condition of structural members, deck, facades, stair and elevator towers, exposed steel, bearing pads, sealers and traffic coatings, joint sealants, expansion joints, drainage, cable barriers, and tripping hazards. Recommended repairs and preventative maintenance included for each parking structure along with parking structure plan and photographic log.

Retail Shopping Center – Roof Inspection

Performed a roof inspection of an existing 7 year old modified bitumen roof. Mr. Molina compiled the report and photographic log for the client, outlining observations and repair recommendations.

Office Building – Property Condition Assessment

Performed property condition assessment based on ASTM E2018-08 for eleven story 11,000 square foot office building constructed in 1972.

Office Building – Property Condition Assessment

Performed property condition assessment based on ASTM E2018-08 for five story office 152,000 square foot office building constructed in 2000.

Retail Shopping Center – Property Condition Assessment

Performed property condition assessment based on ASTM E2018-08 for one story 52,000 square foot retail shopping center constructed in 1975.

Bank Branches (Mold Investigation)

Performed mold investigations for Bank of America bank branches. Took mold samples and provided investigation report.

Structural Engineering – Rehabilitation

Double-Tee Repair

Design of the repair of precast concrete double-tees for a parking structure and roof structure. The design included repair of spalling, cracks, and new structural steel brackets.

Precipitator Support Replacement

Designed the support replacement of a 500 ton, 200' tall multistory equipment structure at a paper mill. The existing support was deteriorated and required replacement. The replacement required an analysis of the existing support and the design of new framing including new concrete pedestals.

Pavement Repair and Secondary Containment Design

A 200-foot section of concrete pavement at a manufacturing plant was in disrepair due to daily loading and chemical attack. ARCADIS was hired to design a new pavement and secondary containment to replace the existing concrete pavement. Responsibilities included initial site visit to document existing pavement condition and limits of required secondary containment, design of secondary containment including preparation of repair drawings, specifications, and bid documents, and periodic inspections of repair work.

Façade Repair Design and CA

Mr. Molina assisted with the waterproofing design, drawings, and specifications for the repair of an EIFS system and store front fenestration system on a high-rise hotel. A combination of poor construction and hurricane force winds and rain caused water intrusion in the past.

Mr. Molina also assisted with periodic site visits during repair to ensure proper repair work and to document change orders and payment applications.

Parking Structure

Compiled waterproofing and structural repair documents for parking structure including production of repair drawings, specifications, and bid documents.



Condominium (Investigation and Design)

The Ocean Pier condominiums consist of four buildings that were constructed in the late 1970's. The existing façade and window units were severely deteriorated and moisture intrusion into the exterior wall cavity had created structural concerns with the existing framing. Performed initial survey to document the extent of deterioration to the envelope of the four buildings and determine the extent of damage to the framing. Provided the condominium board a report outlining our findings with options and price estimates for replacement of the existing façade and repair to the framing for the four buildings. Provided design documents that outlined the replacement of the façade and repair to the framing. Following completion of design administered bidding for selection of contractor.

Condominium (Construction)

Mr. Molina completed full-time onsite construction administration. Administration included overseeing day-to-day construction, coordination and review of contractor submittals, reading and interpreting plans and specifications, issuing field orders, negotiating field changes with contractors, approving change orders and payment applications, and managing contract changes while attending to client's comments and questions.

Hotel

Assisted with the repair design, bidding documents, and CAD drawings. Also complete with on-site visits for quality control and to ensure construction complies with plans and specifications.

Historic Hotel Façade and Fenestration Repair

The façade consists of brick with limestone lintels. The existing windows are wood framed double hung windows. Due to current loose façade items and moisture intrusion into the interior of the facility ownership requested a condition survey of the façade with recommendations for repair and/or replacement. Performed visual survey of façade and provided report outlining current condition with recommendations for repair of the brick façade and replacement of the window units.

Multistory Condominiums

Completed a water intrusion investigation for four eleven story condominiums including repair recommendations and documents for envelope waterproofing and EIFS remediation.

Construction and Environmental Management

Construction Engineering & Inspections (CE&I)

Provided construction monitoring (CM) services for projects that impact CSXT operations and/or property. Responsibilities included attending the pre-construction conference between the contractor and their client to represent CSXT and completing regular site visits to projects to ensure CSXT rules are followed and to ensure minimal impact to CSXT property.



Gabriel Marchi Molina, PE
Project Engineer

Environmental Compliance

Provided environmental administration for the Charlotte Terminal to ensure the Terminal is in compliance with regulations, the Oil Spill Prevention Control and Countermeasure Plan (SPCC), and the Storm Water Pollution Prevention Plan (SWP3). Responsibilities included updating the SPCC and SWP3 plans, completing regular site visits to inspect the Terminal, and giving an annual Environmental Compliance Awareness class to CSX Intermodal employees at the Charlotte Terminal.

Professional Presentations

Gabriel Molina, October 2009. "Working With Preservation Organizations: Restoration of the Seelbach Hilton in Louisville, KY", International Concrete Repair Institute. Mt. Pleasant, SC