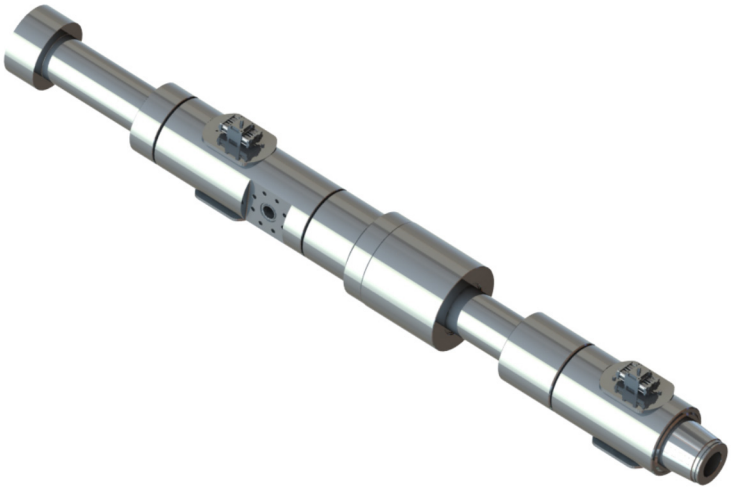
# PRECISION
## ENGINEERING SOLUTIONS



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**337-364-0080**

# PRECISION ENGINEERING SOLUTIONS

1214 Jane St
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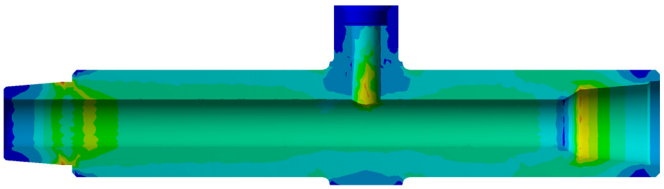
Office: 337-364-0080

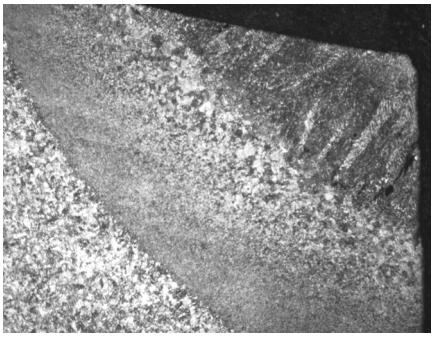
## About:

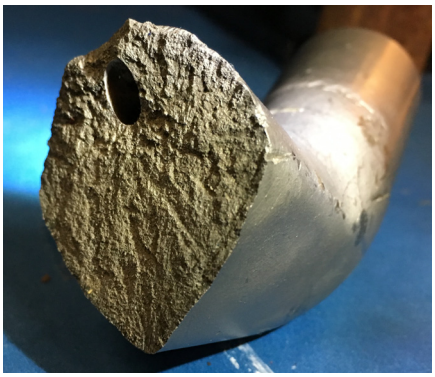
Precision Engineering Solutions was formed as a consulting engineering firm specializing in mechanical engineering services, structural engineering services, failure analysis services, welding engineering services, independent 3rd party BOP design verifications & shear testing, and other 3rd party services. The firm consists of professional engineers (mechanical & civil), mechanical engineers, industrial engineers, designers, analysts, and technicians. The firm specializes in providing services primarily for the oil and gas industry. Modern tools such as 3D modeling, Finite Element Analysis (FEA), Computational Fluid Dynamics (CFD), and digital metallographic & scanning electron microscopes are used to provide state of art solutions.

## Services:

- **Design, Analysis, & Drafting**
  - **Downhole & Surface Equipment**
  - **Structural**
  - **Offshore Basket & Skid**
- **Classical engineering calculations**
- **Finite Element Analysis (FEA)**
- **Computational Fluid Dynamics (CFD) Analysis**
- **Reverse Engineering**
- **Patent development**
- **Product Testing Management**
- **Assembly and Inspection Manuals**
- **Material Selection & Verification**
- **Specification Writing & Review**
- **Third Party Verification for BOP Shear Testing**
- **SPPE Review**
- **Failure Analysis**
- **Facility Auditing**
- **Manufacturing & Inspection Project Management**
- **Third Party Technical Surveillance & Test Monitoring**
- **Documentation Package Review**
- **Welding Procedures, Qualification, and Approval**
- **Corrosion Identification**







**We understand the importance of a quality product delivered in a timely manner.**
**That is why at Precision Engineering Solutions we have made it our mission to assemble a team of proven professionals to deliver a great product to our customers while meeting deadlines that are critical to them.**

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# Company Profile

## BACKGROUND

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## PERSONNEL

| | |
|---|---|
| Charles Kibbe, PE | Partner / Senior Engineer – Registered Professional Engineer (LA & TX) |
| Craig Kendrick, PE | Partner / Senior Engineer - Registered Professional Engineer (LA & TX) |
| Jeremy Hebert | Partner / Engineer – Registered EIT (LA) |
| Derrick Bordelon | Partner / Consultant |
| Jerrod Olivier | Partner / Consultant |
| Hank Boudreaux | Engineer – Registered EIT (LA) |
| Brody Lancon | Designer |
| Giselle Flores | Office Manager |

## KEY SERVICES

- Downhole & Surface Equipment Design, Analysis, & Drafting
- Structural Design, Analysis, & Drafting
- Offshore Basket & Skid Design, Analysis, & Drafting
- Classical engineering calculations
- Finite Element Analysis (FEA)
- Computational Fluid Dynamics (CFD) Analysis
- Reverse Engineering
- Patent development
- Product Testing Management
- Assembly and Inspection Manual Creation
- Material Selection & Verification
- Specification Writing & Review
- Independent 3rd Party BOP Verification, Shear Testing, and Theoretical Shear Calculations
- SPPE Review in Compliance with 30 CFR §250.802 (c)(1)
- Failure Analysis
- Facility Auditing
- Manufacturing & Inspection Project Management
- 3rd Party Technical Surveillance & Test Monitoring
- Documentation Package Review
- Drill Pipe and Down Hole Tool Management
- Welding Procedure Preparation, Qualification, and Approval
- Welding Process Selection
- Welding Code Interpretation and Compliance
- Welding Specification Review, Interpretation, and Compliance
- Corrosion Identification

## ENGINEERING SOFTWARE

- AutoCAD (2D Drafting)
- Inventor (3D Modeling & Finite Element Analysis)
- Solidworks (3D Modeling)
- Ansys (Finite Element Analysis)
- Autodesk CFD (Computational Fluid Dynamics)
- API 16D Accumulator Calculations

## SELECTED JOBS PERFORMED BY PES AND EMPLOYEES DURING THEIR CAREERS

### Design Jobs

- Designed and prototype tested one trip seal system. Received a patent for this work.
- Designed mechanical portion of 3D resistivity prototype tool for a large service company group. Received two patents for work on this project.
- Designed multiple components of a multi zone singe trip completion system.
- Created machine drawings for multiple drill string components such as top drive subs, pump in subs, crossover subs, bit subs, and lift subs.
- Developed calculation rating packages for XN, RN, X, and R Retrievable Locks.
- Developed calculation rating packages for XN, RN, X and R nipples.
- Developed calculation rating package for an API 6A, 15,000 psi rated swivel.

- Created calculation rating packages for multiple IBOP, Safety Valves, Top Drive valve, and Kelly valves.

- Created calculation rating packages for multiple pump in subs, rated to 15,000 psi.

- Created calculation rating packages for multiple wireline accessories such as knuckles, stems, swivels, spang jars, etc.

- Performed reverse engineering, including drawings and calculation package on retrievable bridge plugs.

- Performed reverse engineering including all drawings on mechanical set whip stock anchors.

- Created complete machining drawings for 8 and 6 pitch two-step tubing connections.

- Designed multiple dual string packers, including all drawings and calculations.

- Designed multiple in-string (shear to release and cut to release) packers including all drawings and calculations.

- Completed all machine drawings for a wash-down circulating tool.

- Designed an internal bucking backup tool for making up screen joints.

- Designed down-hole gravel pack system. This included the setting tool, frac tool, and closing sleeve. Modeled entire tool in AutoCad, created machine drawings, performed classical calculations, and performed FEA on selected items.

- Designed and tested a 9-5/8” tool used to measure mud motor inclination at the bit. This tool was designed for 20,000 psi service. Previously assisted with development of smaller sizes of this same tool.

- Designed multiple Hydraulic set permanent seal bore packers with an integral setting chamber. Included all drawings and calculations.

- Designed multiple Double Shoulder connections. Included all drawings and calculations.

- Performed sustaining engineering design work on mud motors for the mud motor design group at a large service company.

- Performed sustaining engineering design work on gravel pack completion tools for a large service company. Designed multiple gravel pack components such as packers, setting tools, frac tools, crossovers, wire-line adapter kits, safety shear joints, indexing mule shoes, etc.

- Reverse engineered casing scraper. Measured all components of the as built tool, created 3D models using Autodesk Inventor, created machine drawings. Performed FEA on key components.

- Reverse engineered overshot retrieval tool. Measured all components of the as built tool, created 3D models using Autodesk Inventor, created machine drawings. Performed load rating calculations for the tool.

- Reverse engineered hydrostatic bailer. Measured all components of the as built tool, created 3D models using Autodesk Inventor, created machine drawings. Also created assembly and servicing manual for tool using 3D models to show in depth detail of each step. Performed load rating calculations for the tool.

- Reverse engineered sand pump bailer. Measured all components of the as built tool, created 3D models using Autodesk Inventor, created machine drawings. Also created assembly and servicing manual for tool using 3D models to show in depth detail of each step.

- Reverse engineered 3 long stroke setting tools. Measured all components of the as built tool, created 3D models using Autodesk Inventor, created machine drawings, and performed classical load rating calculations.

- Designed separators (horizontal and vertical), absorber towers, dehydration units, JT skids, scrubbers, coalescing filters, BTEX units, complete turnkey skid packages and line heaters that were used at production facilities. Used Compress by Codeware to create the 3D vessels in compliance with ASME Section VIII.

- Designed multiple high-speed gear boxes for varying applications.

- Designed a large 30,000 HP drop in replacement cast gear box.

- Designed high speed gearbox running at 70,000 rpm

- Designed high speed gearbox at 60,000 HP to be used in a turbine package.

- Designed drop in replacement gearbox for an existing gearbox in a chemical plant. This gearbox had nine (9) gear reductions to be able to fit in current space that existing gearbox occupied, but was able to handle a new turbine installation.

- Designed multiple 30,000+ ft drill strings for deepwater drilling contractors.

- Evaluated and assisted with the specification of a dual elevator system for deepwater riser less drilling. Also assisted with vendor selection and 3rd party monitoring of vendor performance.

- Performed Lubinski-Vreeland calculations to calculate the bending stresses experienced by a drill string when deployed in a riser less application.

- Performed design, analysis and certification of new and existing offshore skids compliant with Gulf of Mexico and DNV Specifications.

- Designed a Pig Launcher/Receiver and Test Header per ASME B31.3 to include pressure & volume calculations, air inclusion calculations, and pressure increase due to temperature change calculations.

- Developed bolt torqueing procedures for proper torqueing on flanged connections per API 6A Annex D.

## Classical Analysis Finite Element Analysis (FEA)

- Performed FEA and conducted fatigue studies to assist with trouble shooting failed mud motor components.

- Performed multiple FEA on various components of a multi zone single trip gravel pack system.

- Performed FEA on a proprietary tubing connection to assist with trouble shooting test failures.

- Performed FEA on a 1250 ton Drill Pipe Elevator to assist with design.

- Performed FEA on a proprietary tubing connection to assist with pressure and tensile rating of the connection.

- Performed FEA on multiple top drive valve components such as balls, seats, stems, and bodies.

- Performed FEA of 5” and 4-1/2” drill pipe upset configurations to characterize the stress concentration factors in the upset regions.

- Performed FEA on multiple top drive ball valve bodies to quantify the stress concentration in the stem region. Verified stress concentration values during pull testing via strain gage measurement.

- Performed nonlinear FEA on multiple top drive rotary shouldered connection options. Assisted client in choosing an alternate connection based upon analysis. Witnessed and reported on fatigue testing comparing the existing connection and the replacement connection.

- Performed a nonlinear FEA to reproduce a tubing collapse failure due to damage during wire line operation. FEA reproduced the failure mode and final collapsed shape of the tubing.

- Performed FEA on multiple aluminum body Z-bits used during casing running operations.

- Performed nonlinear FEA on a crushed wire line wench drum. Evaluated the existing design and several alternatives to improve the capacity of the drum.

- Designed and performed FEA on a BOP test stand configuration.

- Performed FEA on drilling make and break machine. Made recommendations to the customer on modifications to improve the stress condition of the design. Evaluated alternate design options.

- Performed nonlinear FEA on a 2 million lb drilling elevator in order to correct design flaw from manufacturer and allow elevator to pass API qualification testing. Results of FEA were used to improve the design, and the elevator eventually passed qualification testing. It is currently commercialized.

- Performed nonlinear FEA on a ball valve to quantify the factor of safety against failure due to internal pressure, including the effects of material yield strength reduction due to high temperatures.

- Performed FEA on various sizes and styles of BOP shear rams

## Testing

- Regularly performed 3rd Party Verification Services per 30 CFR §250.732(a)(1) for BOP shear testing. The 3rd party verification included theoretical shear calculations; verification of BOP design, maintenance, & testing; accumulator calculations per API Specification 16D; and BOP shear testing with digital recording equipment & video recording equipment.

- Wrote test plans, organized tests and wrote qualification reports for multiple drilling tools while employed at a large service company.

- Wrote test plan, monitored testing, evaluated results and wrote report with recommendations for a fatigue test of multiple rotary shoulder connection configurations for a top drive.

- Wrote test plan, monitored test, and wrote report for qualification testing of a 2,000,000 lb top drive valve.

- Monitored test results for various completion tool assemblies while performing sustaining engineering for a large service company.

- Witnessed shear testing of various size land and surface blowout preventers. This included modifying test procedures and creating final test reports for customers

- Performed load testing on draw works wire rope used in deep water operations.

- Assisted in the development of test protocol and participated in the Factory Acceptance Testing (in Hamburg, Germany) of elevators, a dolly, and a stool for a dual elevator system used on a drill ship. Also, participated in the on-ship testing (in Yokohama, Japan) of the same dual elevator system.
- Performed hardbanding application testing in order to evaluate a number of different types of hardbanding from various manufacturers. These evaluations included:
    - Visual and dimensional evaluation of hardbanding O.D.
    - Wet magnetic particle inspection of hardbanding and adjacent base metal
    - Microhardness testing of weld metal, heat affected zones, and base metal
    - Microscopic evaluation of the welds for contamination, voids, tie-in, and other irregularities
    - Mechanical hardbanding adhesion testing

- Witnessed functional and destructive load testing of various fishing tools including wireline swivels, rope sockets, and wireline handling equipment.

- Developed and managed simulated process-failure testing at a major line pipe coating plant.

- Assisted in the drill pipe spinner functional test and inspection on drillship to determine the cause of crack indications on the drill pipe.

- Assisted in the development of the test protocol and managed the torque testing of 6-5⁄8 FH landing string connections. This testing was focused on evaluating whether the break-out torque of these connections was affected by thread compound contamination and poor compound application practices.

- Full scale tensile load testing of 6-5⁄8 Slip-Proof™ landing string.

- Assisted in the development of the test protocol and performed functional IBOP valve testing at designed maximum working tensile load.

## Specifications

- Developed and maintained manufacturing specifications for drill pipe, landing strings, heavy weight drill pipe, drill collars, and subs for major drilling contractors, rental tool companies, and a geoscientific research program for use in deep water applications.

- Developed and maintained inspection specifications for drill pipe and landing strings for major drilling contractors, rental tool companies, and a geoscientific research program for use in deep water applications.

- Reviewed and audited manufacturing and inspection specifications for drill string elements used in land and deepwater applications.

## Teaching

- Co-developed and taught 10 sessions (over a 3-year period) of a hardbanding application training course for both in-house and field applications that was part of the certification process of hardbanding operators for a major applicator. The hardbanding application was drill pipe, heavy weight drill pipe, and drill collar.

## Facility & Documentation Auditing

- Performed facility audits of machine shops for major drilling contractors, rental tool companies, and a geoscientific research program.

- Performed facility and field application audits of hardbanding applicators for major drilling contractors and rental tool companies.

- Performed facility audits of inspection facilities in relation to drill pipe inspection for major drilling contractors and rental tool companies.

- Performed detailed audits of manufacturing, inspection, and testing documentation packages in comparison to specifications including API, NS-1, DS-1, and client specific specifications.

- Performed an audit of a major line pipe coating plant including an evaluation of the tube manufacturing plant, coating process audits, and documentation package audits.

## Failure Analysis

- Performed analyses on cracked and parted top drive shaft connections in use in deep water operations.

- Performed analyses on failed drill collar, heavy weight drill pipe, and subs due to manufacturing defects, fatigue, and improper hardbanding practices.

- Performed many analyses of failures in drill pipe to determine the root cause of failure. Some of the reasons for failure found include mill defects, manufacturing defects, fatigue, corrosion, arc burns, material transformation due to use in service, and environmental embrittlement. The following are examples of types of failures analyzed:
    - Connection twist-offs & cracking
    - Excessive connection damage including thread flank, thread root, and sealing face galling & pitting
    - High break-out torque
    - Hardbanding spalling
    - Heat checking on tool joint O.D. surfaces.
    - Tool joint to pipe body weld failures
    - Elephant hide
    - Pipe body washouts (upset region and tube body)
    - Cracks originating in slip cuts
    - Transverse & Longitudinal cracking in pipe bodies
    - Overpull failures
    - Excessive pipe body O.D. mill seams
    - I.D. coating failures
    - Excessive corrosion on the O.D. / I.D.

- Performed analyses on failed casing and tubing in both bodies and couplings.
    - Cracked couplings due to environmental conditions
    - Washed out couplings due to environmental conditions and geometry

- Performed a field investigation of cracked sheave bearings taken from the heave compensators on a drillship. This field evaluation was performed on-site at the bearing manufacturer's facility in Sorocaba, Brazil over a three-week period.

- Performed analyses on failed/cracked draw-works sheaves including failures occurring in the sheave rims, webs, and hubs.

- Performed analyses on fractured/damaged draw-works wire rope and cable/wire rope used in other applications.

- Identified a failure due to hydrogen embrittlement in a high-nickel alloy.

- Investigated Microbiologically-Influenced Corrosion (MIC) in a stainless steel potable water tank for a parish waterworks system. This investigation involved sampling & testing both water & scale for chemical and biological properties. In addition to the chemical and biological analysis, a mitigation and remediation plan was developed for the wells and tank.

## 3rd Party Technical Surveillance

- Regularly performed technical surveillance (over a 15-year period) of the manufacturing of many strings of drill pipe ranging from 5 inch O.D. to 6-5/8 inch O.D. including Slip-Proof™ landing strings adhering to API, NS-1, and customer specific specifications. These strings were manufactured for major drilling contractors, rental tool companies, and a geoscientific research program for use in deep water applications. The technical surveillance included interfacing with the clients and vendors during the bidding/quoting process, conducting pre-production meetings, performing on-site technical surveillance during every aspect of the manufacturing process, assistance in product mechanical property optimization, documentation review, and receiving inspection development & monitoring. The on-site technical surveillance during the manufacturing process included:
    - Evaluation of tool joint material certificates (chemical composition & mechanical properties)
    - Tool joint machining, hardbanding, and inspection
    - Evaluation of green tube material certificates (chemical composition)
    - Green tube upsetting
    - Pipe body heat treatment
    - SEA, EMI, & FLUT inspection of heat treated pipe bodies
    - Welding of tool joints/Slip-Proof™ sections to pipe bodies
    - Final inspection of assembled drill pipe
    - Application & inspection of internal plastic coating

- Conducted pre-production meetings and performed technical surveillance during hardbanding operations on used drill pipe. The following processes were included in the on-site monitoring:
    - New hardbanding application
    - Hardbanding re-application over worn hardbanding
    - Removal of worn hardbanding using carbon arc & plasma arc gouging
    - Application of soft metal for tool joint build-up (submerged arc)
    - Application of hardbanding over soft metal
    - Inspection of tool joints before, during, and after the removal, build-up, and application processes.

- Regularly performed technical surveillance (over a 15-year period) on the inspection of many strings of drill pipe ranging from 5-inch O.D. to 6-5⁄8 inch O.D. including Slip-Proof™ landing strings adhering to API, DS-1 (Category 5 & HDLS), and customer specific specifications. These strings were for major drilling contractors, rental tool companies, and a geoscientific research program for use in deep water applications. The technical surveillance included interfacing with the clients and vendors during the bidding/quoting process, conducting pre-production meetings, performing on-site technical surveillance during every aspect of the inspection process, and documentation review. The on-site technical surveillance during the inspection process included monitoring of the following processes:
    - Visual inspections of pipe bodies, tool joints, and connections
    - Dimensional inspections of pipe bodies, tool joints, and connections
    - Wet & dry magnetic particle inspection of tool joints/weld areas
    - UT of slip/upset region
    - UT of tool joint to pipe body weld
    - EMI of pipe bodies
    - FLUT of pipe bodies and Slip-Proof™ sections
    - Full-length O.D. wet magnetic particle inspection of pipe bodies

- Performed on-site witnessing of the full length ultrasonic (FLUT) inspection of riser choke & kill lines.

- Tracked and monitored the manufacturing and inspection process of a series of BOP spools, spacers, and DSAs in order to expedite and make a critical delivery date for a rental tool company.

- Performed on-site witnessing of mechanical testing conducted at various laboratories for major drilling contractors and rental tool companies.

## Locations Worked

- Manufacturing and inspection facilities
    - Louisiana
    - Texas
    - Oklahoma
    - Alabama
    - Sorocaba, Brazil
    - Hamburg, Germany
- Land rig locations
    - Louisiana
    - Texas
    - New Mexico
- Offshore rig & drillship locations
    - Gulf of Mexico
    - Yokohama, Japan
- One partner holds a current Chinese business visa

## Clients Serviced

- Oil & Natural Gas Exploration and Production Companies
- Major Drilling Contractors
- Service Companies
- Rental Tool Companies
- A Government Funded Geoscientific Research Program
- Equipment Manufacturers
- Welding Wire Manufacturers
- Internal & External Coating Applicators
- Attorneys in relation to product liability
- Insurance Providers in relation to claims
- Parish Potable Water Systems