

















IDEAS IN ACTION

Power Team high pressure hydraulic products in action around the world

Industry

Heat sink maker fills pressing need with RSS2503 250 ton ram

Micro Tool Engineering, of Riviera Beach, Florida, needed a custom hydraulic press. It would be used to seat a special cap on a heat sink manufactured for Digital Equipment Corp. The heat sink contains 606 pins, and the joint between the holes and the pins must be protected from oxidation and other environmental conditions. The process requires 250 tons of force to seat the cap on the 4 in. X 4 in. X 1 in. assembly.

A custom press, purchased from an independent engineering company would cost upwards of \$75,000 to \$100,000, according to Rene LaCrosse, MTE President.

"Instead of spending that amount and reinventing the wheel," LaCrosse said, "we called on Power Team, told them what we needed, and used their standard hydraulics and advice on a press that works like a dream. And we did it for about \$12,000."

MTE built their press using a Power Team PE55F series two speed, electrically powered hydraulic pump and a spring return Power Team RSS2503 250 ton, hydraulic ram. The pump is also equipped with an automatic pilot operated valve and a special control that cycles the crimping process. It measures just 2 ft. sq. and stands 4 ft. high.





Steel mill wedge-block retrofit uses RSS1002 100 ton rams to fix old problem

Timken had a maintenance problem at their Gambrinus steel plant in Canton, Ohio. For thirteen years there were weekly maintenance problems with the hydraulic cylinders on eight piercing mill top-cap wedge blocks. Chips and debris entered the open end clearance of the bore, scoring the cylinders and pistons and destroying the O-rings. Costs ran as high as \$2,000/unit for each repair. "Leakage happened regularly. We had up to three wedge blocks to rebuild in one weekend alone," said Fred Stein, Timken's tube mill planner.

Stein, along with Jerry Gardner, the mill's reliability supervisor, and James Diggs, the reliability engineer, worked on a retrofit solution. They called Power Team's Mark Berta and Tony Mazzella of Mazzella Wire Rope & Sling, a Power Team distributor, for help.

The wedge block's cavity was re-bored to accommodate a Power Team RSS1002 100 ton hydraulic ram. Its self-contained design

would help prevent exposure to debris. Timken ordered the ram "back-ported" with the inlet port on the bottom instead of the side. They also specified custom drilling and tapping of the base. The ram was installed with the piston inward. When retracted, the base is near-flush with the face of the wedge block. A Power Team "Quick Disconnect" was installed for easy repairs.

Eight months later, Stein and Gardner are still waiting to try the quick disconnect coupler. "We have not had one minute of maintenance time on the Power Team jack since it was installed," said Stein. Gardner added, "We were elated," and, "Very little thought is given to the wedge block. We can now focus on other things."

Paper mill cuts downtime and disassembly damage with PH1002 100 ton puller

Removing shafts, bearings and shaft-couplings, both in the shop and in the mill, is a regular daily task for the maintenance shop for a large paper mill on the West Coast. Often heating and cutting torch operations were required, which resulted in damage to the components. "At \$500 for a shaft and \$500 for a coupling," their supervisor said, "replacement costs add up in a hurry."

They purchased a Power Team PH1002 100 ton hydraulic puller that can be used in the shop or transported to the mill, where a special bracket lifts it up to the machines. It was purchased with 4 adapters. An additional adapter was fabricated by the mill.

The new puller has resulted in

considerable savings for the mill. "We haven't ruined any equipment or had to remake a coupler since we got the big puller," the supervisor said. And, a process that used to take 4 man hours is now done by 1 man in minutes.

The Power Team PE552S two stage 10,000 psi pump that powers the puller serves double duty. It is also used by the shop's two vertical presses when needed.

South African steel maker tests sheet with C552C 55 ton ram

Steel used in automotive bodies must meet rigid standards in order to withstand the forming process. "Orange peal effect" is a transitory indicator that sheet steel does not meet specifications. As sub spec. steel is formed or

stretched to a predetermined point a roughened appearance occurs along the bend line. This effect disappears as the deformation increases.

The quality assurance department of a steel producer in South Africa, needed a press to test its sheet. Power Team hydraulics were used in its construction.

A steel sample is cut from a production run and is clamped into the press with a Power Team RH603 hydraulic ram. A "piercing" die is pushed into the sample, from the bottom, by a Power Team C552C hydraulic ram. A QA technician observes the deformation from the top, looking for "orange peel". The press is powered by a PE174 pump. Deformation pressure is set by a Power Team 9633 relief valve.



Industry



Specialty printer assembles rotogravure cylinders with RD2006 ram

Orchard Corporation of America is a specialty printer that uses rotogravure to create decorative printing for their customers. Their products are used for a variety of laminations, from floor tile to furniture. Other printers also use Orchard's plate making and cylinder facilities.

Pressing rotogravure cylinders onto the mandrills had been a difficult process, requiring manipulating 550 lbs. assemblies into a horizontal shop press and around its cribbing and jigging. The process required considerable care and excessive labor.

Orchard designed a mobile hydraulic press specifically for insertion and removal of the mandrills. Using a Power Team RD2006, 200 ton double acting hydraulic ram and a Power Team PE55C Series hydraulic pump with electric 4-way valves, the press can be rolled up to the job. After manually mating the end of the mandrill with the opening in the shell, the operator uses a hoist to lower the partially assembled cylinder into the press sling. The 6-5/8 in. stroke of the ram can usually seat the mandrill in a single stroke. If not, the

mandrill and shell can be repositioned and the operator can give it another shot. Approximately 60,000 lbs. of force is used for most shells, but as much as 100,000 lbs. have been needed, according to Philip Bergmann, project engineer for Orchard.

Torque rods are put to the test with a Power Team custom shop press

Third World countries order refurbished Army surplus trucks from Southeastern Equipment Company. This Augusta, Georgia, company buys the trucks, many of which are damaged, and restores them.

The critical component in these trucks is the torque rods for the front suspension. When replacing torque rods, Southeastern must confirm that the rubber bonded rods will meet load specifications without failing.

Southeastern's Carmen Jennings ordered a Power Team 25 ton Shop Press with custom additions. The Shop Press depresses the rod ends by as much as 3 in., at a rate of .2 in./min., until test load specifications, of 11,000 lbs. for the 2-1/2 ton truck torque rods and 16,000 lbs. for the 5 ton truck torque rods, are reached.

The press is equipped with an electrically driven, two stage RamRunner PE17 series hydraulic pump. Customization included adding a Power Team pressure switch and a 4-position, 3-way, pressure compensated, flow control valve. Jennings added components such as a load cell with a digital readout and gauge modifications. They permit Southeastern to rapidly and precisely control the tests.



M-60 tank drive assembled with C556C 55 ton ram and hand pump

The 865 lb. final drive unit for the Army's M-60 tank requires as much as 25 tons of force to join its bearing, gear and shaft assemblies.

The drive's armor-plated housing is rolled on rails under a press, and the main driveshaft and bearing assembly is forced together. Then the housing is turned upside down and returned to the press so the bull gear and bearings can be assembled.

Lynd Gear of Rochester, Michigan, the drive's manufacturer, uses a special fixture, equipped with a Power Team C556C 55 ton spring-return hydraulic ram, for its press. The ram's 6-1/2 in. stroke is more than enough to complete the longest pressing in a single setup. The ram is powered by a Power Team P159 hand pump.

Gary Mabie, the plant manager, said that the Power Team hand pump allows better control of the press. He went on to say, "We bought a heavier ram than was needed so there is plenty of power in reserve."

POWER TEAM



Forty C108C rams make a game show carrousel portable

NBC uses a motorized 40 ft. diameter turntable on a game show. Between shows the platform is put into storage. It is then moved from storage into whichever studio is to be used for the show's next production. The welded steel structure breaks down into 11 segments. These segments, however, are too heavy to be easily lifted onto their casters.

Forty Power Team C108C 10 ton spring-return hydraulic rams, divided among the 11 sections, lower the auxiliary storage casters, lifting the section's wheels free of the floor. The entire system is powered by a single Power Team P460 two-speed hand pump. A manifold connects each section's rams and is equipped with a Power Team quick disconnect. When the pump is removed a shut-off valve retains pressure.



Using Power Team hydraulics to raise a section is considerably more efficient than using the 12 to 15 people formerly needed to lift it. Additionally, this method eliminates frequent damage to the lightweight facade that hides the mechanicals in the bottom.

Industry



Inflatable jacks make mobile homes transportable

Golden West Homes manufactures single, double and triple wide mobile homes at 3 sites in Oregon and California. They used a specially constructed, electrically powered hydraulic scissors jack to lift the large half-sections to attach the wheels for transport. "The scissors jack had lots of maintenance problems. The seals and valves would go out and the guys pulled cords loose. It was a real problem," according to Clark Fuller, Golden West's production manager.

Fuller got his answer from a wind storm. A towing company, hired to right an overturned half section, used a Power Team inflatable jack. "I thought, if those jacks came in a smaller size, it could solve my lift dilemma. The distributor was very helpful. They quickly helped me choose the jack best suited to our needs."

Fuller chose 4 Power Team IJ3213 inflatable jacks. They are 24 in. X 24 in. and can lift 32 tons at 116 psi. The jacks were equipped with 350208 air hoses and 350090 air controllers. Golden West powers them with shop air.

Fuller commented, "One person can operate it and complete the lift in a matter of minutes. They've worked very well." And, "They are virtually maintenance free." He also thinks that the lifetime warranty is a real plus.

Golden West lifts nearly 50 units a month with no downtime for maintenance.



Archery bows laminated in automatic 150 ton press

Hoyt USA, in Salt Lake City, makes archery bows and accessories. Problems with their lamination press included uncontrollable, rapid closing of the dies that left trapped air between the layers.

Power Team combined their Heavy Duty 150 ton press with a 10,000 psi PQ series Quiet Pump. Special controls, designed by Power Team's engineers, allow the press to move rapidly to take up, but then slow as the press builds pressure under load.

Resin coated fiberglass for three sets of bow "limbs" are loaded into the press. As pressure builds, trapped air is expelled from between the fiberglass laminates. The pressure then holds at 60,000 lbs. for a preset period. After lamination, the limbs are heat cured in an oven.

Robert Rode, Senior Vice President of Hoyt, said, "The Power Team control unit and hydraulic circuitry

made all the difference". He went on to say that the press was chosen because of its throat size, its close tolerances, and because its 150 ton capacity could easily provide the 90 ton force needed.

Precision press modernizes traditional herbal extract business



Michael Volchok's family business, Blessed Herbs, manufacturers pharmaceutical-grade extracts for medicine and therapeutic use. Ground herbs are mixed with distilled water and pure alcohol, and aged to liquefy their essence. This mash is then put into a press where the liquid is expelled and collected. His old press used a modified, hand-cranked, 8 ton auto jack.

A renewed interest in healthy foods and herbal medicines has helped Volchok's business grow. Power Team Hydraulics has helped him keep up with demand. His new press is driven by a Power Team RD5513, 55 ton ram mounted on a specially designed frame. A Power Team PE214S "Quiet Pump" powers the ram. A gauge and a control panel provide easy operation. The press advances at a constant pressure of 8000 psi.

"The Power Team equipment is so smooth, so quiet, so efficient and we haven't had a leak or a problem," said Volchok, He added, "We collect 15 percent more juice."



File cabinets built better at a lower cost with SPE10013DS 100 ton press

Haskell, an office furniture maker in Pittsburgh, reviewed the operation for their file cabinet line. A mechanical press, used to form a critical drawer part, made only one bend. It could not hold the tolerances needed and made the bends too fast for proper quality. Labor and equipment needed to complete the part, storage costs for unfinished parts, and a high reject rate added to their problems.

Switching to a Power Team SPE10013DS100 ton capacity shop press with a 100 ton RD series ram would save them \$20,000 per year, reduce rejects, and be \$30,000 less expensive than an alternative. The press is powered by an electric motor driven Power Team PE4004S hydraulic pump. The pump delivers 1 gal./min. at 10,000 psi.

The hydraulic press makes 4 folds over the modified die in one stroke, making 6 complete plates/min. "The slower (close) rate gives better control with a nice, uniform bend," said Lewis Sherer, the plant engineer. Joe Stock, Haskell's tool and die superintendent, said, "I think the Power Team press is great. We're holding our dimensions to exactly what we want." Sherer agreed, adding, "With the mechanical press, we had misshapen bodies. The Power Team press keeps the bends right at 90 degrees... we're between 95 and 100 percent acceptance now."

Bridge Construction/Maintenance



Bridge contractor lifts concrete anchors using RD20013 rams

Almost half of a floating bridge in Washington's Hood Canal was destroyed by a storm. The 3/4 mile section, including its swing section for the shipping channel, was replaced by J. A. Jones Construction Company.

The replacement section is held in place by 26 concrete anchors, 46 ft. in diameter and 29 ft. high. The anchors were completed in two stages. The first stage consists of pouring 207 yds. of concrete, weighing 414,000 lbs., for a base. After curing, the base section is lifted in stages into a gantry that transports it to an 8 track carrier. It is rolled along its "assembly line" to where the circular walls of these immense structures are poured.

To lift the base section, Jones uses 8 Power Team RD20013, 200 ton hydraulic rams mounted on the gantry, 2 rams on each of the 4 lifting heads. Each lifting head is secured to the anchor's base by threaded rod, screwed into inserts molded into the concrete. The rams are powered by a Power Team PQ1204 10,000 psi electrically driven hydraulic pump.

After completion and launching, each anchor, which now resembles a

huge floating bucket, is towed by tug to its final site. Then it is sunk by filling it with gravel.





Suspension bridge contractor lets Power Team pumps pull the load

The "Old Cochrane Bridge" was being replaced. The Alabama Highway Department and its general contractor, Herbert Construction Company, built a 1-1/2 mile, four-lane, \$70,000,000 replacement over the Mobile River. Supported by 34 piers, the bridge has a 1500 ft. balanced cantilever, cable-stayed main span. Altogether, 200,000 tons of concrete was used. Power Team 10,000 psi hydraulic pumps were used for a variety of tasks on this mammoth project.

POWERTEAM

Power Team high capacity PE2000 series pumps, pumping oil at up to 5 gal./min., were used to pull the cables. The pumps powered huge special rams that were lifted into place by a service crane. These same pumps powered the traveling concrete forms that were used to pour the 96 bridge segments out over the river.

Power Team PE554 hydraulic pumps were used in the stressing operation. After each segment was poured, the 36 longitudinal Dywidag bars, at each of the 4 headers, had to be stressed by applying 100 tons of force to each bar. The concrete forms were then lowered and moved to the next position.

The 15 Power Team pumps performed without problems, according to Bill MacWilliam, a Herbert engineer.







"Shorty" rams lift bridge without interrupting traffic flow

The Cincinnati section of I-75, in Ohio, was being resurfaced with a 7 in. layer of asphalt. To prevent excess additional weight on the overpasses, however, overpass surfaces were to be re-faced with a 1-1/4 in. overlay of concrete. Each overpass would then need to be raised to within 1/4 in. of the new asphalt surface, a 5-3/4 in. differences in height. All, without stopping traffic!

Power Team provided a lift system that uses 32 Power Team RSS1002 "Shorty" rams. They are each powered by a

Power Team PE174 pump. Switches added to the pumps permit take-up of the cylinders before starting the lift. A custom electrical control operates all the pumps, either individually or simultaneously.

Other safety measures included Power Team load lowering valves and Power Team 9794 Quick Disconnect No Spill couplers.

The first of 16 overpasses to be raised was a 165 foot-long, three lane, 700 ton bridge. It had 32 lift points at the junctures of 8 beams. The lifting stage, which began at 11:00PM, was conducted in 1-3/4 in. stages. Each lift took only 2 min.

Bridge Maintenance

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Floating bridge uses 52 center-hole rams for adjusting anchor cables

In Seattle, Washington, an I-90 bridge crosses Lake Washington. The bridge's deck sits on 20 concrete pontoons that are tethered to their anchors by 52 2-3/8 in. steel cables.

POWER TEAM

Power Team 150 ton RH1508 center-hole rams are permanently connected to each of the cables; tensioning rods. Each ram has its own Power Team PE174 electrically powered hydraulic pump.

Cable tension is adjusted at seasonal "low water" and again at "high water". Workers relax the load on tension adjusting shims with the RH1508 rams, check the tension, insert or remove shims, release the rams and recheck the tension.

Ted Dempsey, Washington DOT's Bridge Maintenance and Operations Superintendent, said, "The Power Team equipment has proven to be a reliable, maintainable and efficient system."



S.S. LA.F.

Bridge maintenance trolley gets a brake from C55C hydraulic rams

Leaf spring actuated "parking brakes" failed to release properly on a traveling painters scaffold for a truss bridge. Salt air corrosion, at the Benicia California coastal location, was blamed for failure

of the electrical solenoids. The scaffolds, as large as 30 X 40 feet, ride under the bridge deck and are used for painting the underside components.

In a system designed by Robert Bridwell, from the California Department of Transportation, two C55C 5 ton spring return Power Team hydraulic rams replace the electrical components. Each ram presses against 2 of 4 springs. The spring return rams retract completely clear of the brake's mechanical assemblies, assuring freedom for the springs to actuate in a fail-safe arrangement. The rams are powered by a Power Team two-speed P59 hand pump.

Custom keepers were installed to permit removing the rams when the system is not in use. Removing

the rams extend their life by protecting them from the environment and securing them from theft.

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A lift and a push from Power Team rams set a bridge pier straight

Inspection of a 1470 foot bridge entrance ramp to West I-94, in downtown Minneapolis, disclosed that pier #9 was out of plumb by 3 in.. Bearing pads were overhanging the cap. Design deficiencies had allowed the pier to move.

MN/DOT decided to use Power Team hydraulics to lift the bridge and shift the cap. Light weight and flexibility of hydraulics was an important feature in this application. Power Team hydraulics offered the strength and subtly of control needed to provide massive force in just the right increments needed for this job.

Power Team supplied five RSS1002, 100 ton rams, controls, and a gas powered pump for vertical lifting. Three Power Team C256C, 25 ton 4 in. stroke rams, with a 10,000 psi electric pump and manifold system, were used for the horizontal push.

In the first lift, the 100 ton rams lifted the concrete and steel sections off the cap and the elastomeric bearing pads were repositioned. The rams were then topped by rollers, to provide for movement, and the section was raised again.

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The horizontal shift operation needed sufficient power to force the pier cap to within 1/4 in. of its original position, without causing damage to bridge components against which it pushed. MN/DOT engineers calculated that the Power Team C256C rams were just the right size for the job.

The bridge crew provided Power Team with its best complement when they said that the vertical lift and the horizontal shift were virtually flawless.

General Construction



Power Team hydraulics help fix a new foundation

A bank addition in Cummings, Georgia, was settling even before the steel framing was erected. The slab had cracked and the brick veneer had separated. Soil tests concluded that fill had not been compacted properly under the problem area.

The contractor called Atlas Piers of Atlanta. They installed 25 Atlas piers driven to depths ranging from 24 to 42 ft. using Power Team C256C hydraulic rams. The rams were powered by Power Team PQ603 electrically driven hydraulic pumps.

Atlas then raised the building section using Power Team C256C hydraulic

rams. A Power Team P159 hand operated hydraulic pump connected to a 9635 manifold equipped with 9575 shutoff valves and 9063 gauges provided the power and control for the lift.

Construction proceeded, during the installation and lift, without interruption and the contractor met his schedule.

Sagging auto dealership put on the level with Power Team system

A Ford dealership in Cedar City, Utah, experienced problems with its showroom and service building from the start. The buildings were built without a geotechnical workup and they were settling. Early efforts to solve the problem did not go deep enough to reach load bearing strata and the problem got worse.

Atlas Piers of Utah was called to determine a solution for the very upset owner. Atlas is able to load test each pier as it is driven. They placed 38 piers along the showroom and 35 along the service bays. Then they cut off the unsuccessful concrete piers and lifted the building using a system based on Power Team hydraulics.

P159 hand pumps.



POWER TEAM

As the building was raised, large voids in the soil demonstrated the degree to which the building had settled. After the building was level, grout was pumped in to cap the piers and fill the voids.



Apartment building gets a real lift from Power Team equipment

There were serious structural faults in a twelve unit, four story condo. The association called Dick Zavesky, an engineer, who, in turn, called Premium Technical Services Corporation (PTS), a specialist in soil problems. They discovered that the footings for an annex had been placed on an organic soil base, instead of undisturbed subsoil. The 62 ft. building and its foundation would need to be raised 4 in. on one end. The building would be supported independently, and the foundation then lifted to close the gap. The foundation lift was estimated at 240,000 lbs.

PTS and Power Team worked together to design a new system for raising the footings and foundation.

Power Team supplied six 25 ton, 6 in. stroke C256C spring return rams. The Power Team PE172 electrically driven pump was connected to a 6 valve manifold block with gauges

and needle valves. Thirty-foot hoses connected this control center to the rams. PTS installed their patented foundation brackets. Patented helical pilings were screwed past the soft ground, into the firmer subsoil. Zero clearance adapters permitted the rams to push down against the pilings while being mounted above the brackets.

The operation evenly and slowly closed the gap in a 2 hour lift. The system helped keep workers away from the foundation during jacking.

Ron Melworm, president of PTS, chose Power Team because, "Power Team was the most responsive of any company contacted. They also have the best manifold system. It's more uniform and easier to operate."

Zavesky said, "The technique distributes the lifting force more uniformly than previous methods." He added, "It was a pretty good marriage of a contractor and equipment supplier."



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General Construction



POWER TEAM

C1506CL rams hold legs in alignment in towering casino

Grand Casino's tower will dominate the sky 1149 ft. above the streets of Las Vegas. It sits on three 775 ft. legs that curve gently inward towards a hexagonal center column and then outward to the base of a mushroom-shaped hotel, entertainment and casino complex.

The 20 ft. X 32 ft. rectangular concrete legs, each weighing about 4,000.000 lbs., must be poured using forms that twist and deflect inward with gravity. The challenge was to position each leg's top to mate properly with the bottom of the hotel's pad while remaining parallel with the facing center column's wall. Construction requirements limited the force applied to each leg to no more than 225 tons. Power Team hydraulics were used to counteract deflection and control twist in these forms.

The contractor, Advance Steel Systems, used six Power Team C1506CL 150 ton locking collar rams powered by a Power Team PE553 pump. The C1506CL rams, controlled by



three 9642 two-way manifolds, provided precise force and long term holding capability. Two rams were attached to each leg 225 ft. above the base. They applied the force necessary to move the forms the required 3 to 4 in. to position the legs. The collars were then locked and the concrete was poured. After the concrete was cured, the rams and forms were removed and construction continued.

CWER TRAN

POWER TEAM

Quiet hydraulics lift floor without disrupting college classes

The University of Arkansas business administration building, built in 1975, had some structural problems. Back-fill had allowed a 2000 sq. ft. section of the slab to sink enough so that interior partition doors cracked, walls buckled and ceilings twisted. Cracks had formed, doors would not shut and pencils rolled off flat surfaces.

The contractor used weighted Power Team C256C hydraulic rams, driven by Power Team PQ603 pumps, to drive steel piers through the sinking back-fill, into a weathered shale subsurface below. Then they jacked the slab in stages, using 25 Power Team C256C, 25 ton hydraulic rams in groups of

5 in a "leap-frog" pattern. Each group used a Power Team P159 two-speed hand pump. The pumps were equipped with 9635 manifold blocks, 9575 valves and 9052 gauges to control the lift.

Permanent steel plates under the slab secured it to the piers. A cement and sand grout was pumped into the void. They then patched the 50 jack holes in the floor, leaving little evidence of the repairs. The quiet operation of the Power Team equipment meant that classes in nearby rooms were not disrupted.

800 ton tunnel "mole" gets even support from 16 rams

Cutting the "Cross-town" pollution abatement tunnel left an 800 ton Tunnel Boring Machine(Mole) 21,250 ft. into the limestone and 300 ft. under Milwaukee. It had to removed before the concrete lining could be installed. Removal of some of its components reduced the 70 ft. Mole to 600 tons. Unevenness of the rail bed, however, would result in individual wheels unloading. Loads would then be distributed among the other wheels, causing stress damage to the rail system.

This was a formidable lift. It was managed by 4 specially constructed 8 wheel dollies. Each dolly was equipped with 4 Power Team C1006C 100 ton rams for lift and load management. Load inequalities were balanced by this dynamic system of 16 Power Team C1006C rams, powered by electrically driven, Power

Team PE552 series, hydraulic pumps and monitored by individual pressure gauges. Because loads were evenly maintained on all wheels, redistribution of the loading and stress to rails were minimized. The results were substantial reduction in repair costs from damaged rails for the contractor, Dillingham Construction, Inc, and their partners.





Center-hole rams tension tower cable in suspension roof

Howard Needles Tammen & Bergendoff architects specialize in bridge design. They were awarded the design for a 720 ft. long by 300 ft. wide convention center addition for Kansas City, Missouri. The design straddled downtown streets and 2 interstate freeways. A major design criteria was that there be no interior columns and few internal trusses.

The firm's design meshes several design elements from bridges with those of buildings. The structure's floor is a bridge, supported by piers carefully placed between the streets and highways below. The roof is a second bridge that is suspended on 56 wire cable stays, threaded through four 280 ft. tall pylons. Fourteen cables in each pylon support the steel roof. The visual play of the cable towers and the open space of the interior have a critical role in the building's success.



The contractor needed a safe, controllable and economical cable stay tensioning system capable of applying up to 290,000 lbs. of force to an individual cable. They selected Power Team RH2008 200 ton center-hole rams with an 8 in. stroke. Power Team's PA554 air-driven 10,000 psi pumps were used because they provided greater control. Using 2 systems, the workers tensioned the cables in opposing pairs.

Utilities/Rigging



Heavy heat exchangers travel light with help from Power Team hydraulics

Sheedy Co. of San Francisco was allotted 45 days to replace heat exchangers in the turbine building of PG&E's Diablo Canyon plant. Power industry down times are managed closely. The job was complicated by lightweight floors and by pipes, columns, and other obstacles. Moving 31 heat exchangers ranging from 30 to 60 tons through that maze, over the lightweight floors, required flexibility of movement and careful load distribution.

Sheedy used Power Team 15 ton hydraulic rams in special fixtures created to cradle, jack, and skid the exchangers. The rams for each exchanger were powered by one electrically driven Power Team 10,000

psi hydraulic pump. Each exchanger's load was distributed over 8 support points on steel slide plates. These loads were controlled and balanced using Sheedy designed, custom pressure manifold. Soap-lubricated Teflon® pads and ball roller clusters, were interchangeably attached to the bottom of the support points. The arrangement provided easy movement through the tightly mapped pathways to cranes outside the building.

Altogether, Power Team supplied a total of 45, C1510C, 15 ton hydraulic rams and 3, PE183-2, 10,000 psi hydraulic pumps.



Inflatable jacks provide the gentle force required for boiler tube maintenance

Boiler tubes, the pipes that transfer heat to the water inside a steam power plant, require frequent inspection, maintenance and repair. In order to make repairs to tubes deep inside the boiler, obstructing tubes, closer to the access point, must be removed or separated. Removal is seldom practical. Pushing them apart has been a slow process using "come-alongs" and blocking. There is a chance, with this method, that the tools will kink or pierce the tubes.

Bill Sullivan, a construction manager at ABB Combustion Services, introduced ABB to the use of Power Team's 32 ton IJ3213 inflatable jack. Placed between the tubes, the jacks are inflated to nearly 90 psi air pressure, expanding the space between the tubes in less than 5 minutes.

Tubes that are normally spaced 6 in. on center are gently separated



enough for a mechanic to crawl between. "The Power Team inflatable air jacks are very safe and durable," said Sullivan. "We've had these jacks in use for 6 years and there are few signs of wear and tear. They take a lot of abuse."



Heavy live rocket motors get delicate lift by stacking tough inflatable jacks

Fifty-two live Polaris rocket motors at Hill AFB, stored in close quarters, needed to be moved. Because they contained explosive material, safety was a great concern.

Eldon Seagrist, the project's engineer, Earl Roberts from Gustin Hydraulics and Power Team's Allan Wood worked on a solution to get the cradles safely onto their bogie wheels so the motors could be rolled out. "We looked at a couple different mechanical jacks, but we couldn't get the collapsed height. We pretty much went directly to the (Power Team 32 ton #IJ3213 inflatable jacks). There's nothing else out there like it." Deflated the 24 in. X 24 in. bag is 7/8 in. thick. At 8 in. inflation it will support 11,000 lbs.

The team devised a system where air jacks are stacked in a pyramid arrangement and placed very close to the V-rails at all 4 corners to provide a 13-1/2 in. lift on a stable, non skid platform. Each inflatable jack is controlled by its own Power Team #350090 air controller and a #350207 shut-

off assembly. The controls are connected to the air jacks by #350208 hoses, allowing the operators to manage the lift from a central location.

Seagrist said, "The army was pleased. These jacks have worked out well." Roberts added, "Everybody involved was really impressed."

Sinking dream for Delta home owner rescued with help from Power Team hydraulics

Abry Brothers, Inc., a 150 year old New Orleans foundation specialist, was called in by the owner of a 4,000 sq. ft. suburban home. The 104 wood pilings that supported the concrete foundation web had begun to settle causing cracks in the walls, sagging roof sections and a 7 in. slope in the floor. Greg Abry, the firms president, said that Mississippi delta soil is a "foundation nightmare".

Abry Brothers' workers dug tunnels under the foundation. With the help of Power Team hydraulics they drove new concrete pilings, in sections, into load bearing ground and restored the home to level.

Power Team C1010C rams, powered by a Power Team PE553 pump were used to drive pile sections 40 ft. through the delta soil into a more solid layer. They then poured a new grid, binding the old wood pilings to the new concrete pilings. Additionally, thirty Power Team C258C 25 ton rams, controlled by three manifolds, became a part of the network of 100 rams used to lift and level the house. "We used every last jack we had access to," said Abry.

The owners remained in the house during the three month process. The owner, pleased with the results, said, "now the countertop is level, the splash guard is back against the wall and the doors are fine".



Mining/Quarrying



Quarry improves safety and reduces waste with inflatable jacks

Conventional methods for "turning" cuts in a limestone quarry consist of pulling the slab from the face using cranes and cables. A typical cut is 60 ft. long, 4-1/2 ft. wide and 12-1/2 ft. high. At approximately 250 tons it is dangerous and difficult to turn. Cables can break and whip-saw anything in their path. Equipment can tip, break or fall.

An Indiana limestone company has substituted Power Team IJ7320, 73 ton inflatable jacks to push the cut away from the face. The inflatable jacks are equipped with shutoff valves and dual controls. After 100 ton hydraulic rams crack the limestone away, the 7/8 in. thick jacks are inserted into the gap and inflated. As the gap widens beyond the capacity of the single jack, additional jacks are stacked together, lower in the crevice. The process is repeated until the cut is turned.

The ability to carefully position the inflatable jacks and the jack's powerful controlled push, provides an additional margin of safety, saves time, and reduces stone breakage over previous methods.



Marion dragline repair is big lift for Power Team equipment

T.I.C., the repair contractor, and Falkirk Mine officials set up a 92 day, round-the-clock, schedule for maintenance of a 6 story high, 13.6 million lb. Marion 8750 dragline. Safety for 100 workers was a major concern. Power Team supplied the lift equipment and expertise in one of the largest lifts in Power Team's history.

To begin work, the upper section was raised using four Power Team 500 ton RD5006 rams, and the lower "tub" section was moved to a special concrete pad for repairs.

Seventeen Power Team RD5006 rams, each connected to its own Power Team PE194 hydraulic pump, were placed on the concrete pad, underneath the upper rotating section with its supports for the boom and shovel. The pumps were connected to an operator's control panel with pressure gauges for each ram. A single operator could control the entire system.

The upper section was first lifted to "as digging" position for repair. Then the system was used to level the rotating frame, so the precision traveling mill could machine the roller circle.

Carroll Dewing, Falkirk's project engineer, said, "The system sent us by Power Team was quite easy to control." And, "everything worked well."

Virgil Tatman, T.I.C.'s superintendent, agreed, "It was probably one of the nicest systems I've worked with. Power Teams pilotoperated check valves were excellent. They made lifting a smooth process. We'll definitely go with that system again."

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Rock crusher mantles secured with RH503 center-hole rams

Each rock crusher in the Azusa California aggregate plant, owned by Transit Mixed Concrete, contains 6 internally mounted hydraulic cylinders for clamping functions in the mantle and bowl assemblies. Rock crushers provide a dirty and demanding environment for hydraulic components. Original, custom hydraulic rams failed often, were expensive, and took 4 hours to fix.

The people at Transit Mixed Concrete retrofitted each of

their 4-1/4 in. cone crushers with 6 Power Team RH503 center hole hydraulic rams powered by a PE183-2 pump. Components rated at 10,000 psi and costing half the price of the original, they are operated at 2,500 psi in this clamping operation.

The Power Team 3 in. stroke rams have operated for over a year without failure, but servicing them when necessary should not be a problem. They can be removed quickly by unscrewing the top nut from the threaded center-hole rod and uncoupling the hydraulic "quick disconnect" fitting.



Transportation



Lifting the frog is every day work for Power Team's Track Jacks

Railroad maintenance-of-way has changed slowly over the years. For instance, the conventional method for lifting and leveling the frog in diamonds and crossings is to use multiple hand jacks that often require more than 200 lbs. of handle effort. After ballast is tamped under the ties, the jacks are removed. The process takes several people just to complete the lift. Working in close proximity to the jacks provides the

possibility for injury.

A Power Team Track Jack system, designed for general purpose track maintenance, greatly ;improves speed, safety and efficiency for lifting the frog. The toe sections of 2 Power Team J119T springreturn 11 ton jacks are placed under each side of the frog. The jacks are powered by a gas driven PG303 pump. A single operator can set up the jacks and operate the pump. Quick couplers provide clean, fast connections to the jacks.

A three-way control valve on the pump and a manifold, gauge and needle valve assembly manage the load. This centralized control lets the operator keep clear of the jacking equipment and permits him to sight the track.



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P157 hand pump speeds opening thrust reversers on DC-10 engines

Manually opening thrust reversers for maintenance on a DC-10 is slow, using the pumps supplied by the manufacturer. Jack Cole, the support administrator for field line maintenance at Federal Express, wanted to streamline the procedure.

Cole selected Power Team P157 two-speed hand pumps to open the cowlings faster and easier. The pumps rapidly advance the rams at low pressure of about 1400 psi with a high oil volume. They also supply high pressure at a lower volume. A safety release valve prevents exceeding the 10,000 psi limit.

Cole said that mechanics can now open the 400 lb. cowlings with a

few strokes of the Power Team pump and, "the pump's reservoir is very sufficient." After service the safety locks are removed, the pump's pressure is released and the cowlings close gently.

Light-weight aluminum rams help load heavy electric transformers

Moving a heavy electric power transformer onto a rail car requires jacking and cribbing in a series of lifts. Then, supported by rollers, it is slid onto a truck or a rail car for transport to the site.

Maneuvering the rams into

position has been made easier by tests at the Bonneville Power Administration in Vancouver. They lifted a 140 ton transformer using Power Team aluminum rams that weigh only 49-1/2 lbs.

The Power Team RA1006, 100 ton rams are powered by a Power Team PE553 electrically driven hydraulic pump equipped with a 9579 load lowering valve.

The results were promising enough that crews have since gone to Grand Coulee Dam to move

a 240 ton transformer using the same method. Additionally, the Power Administration has also approved Power Team's 55-ton, 24-lbs. aluminum rams for lighter lift requirements.



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Boxcar repair rolls along easily with 100 ton ram and gas powered pump

Laurinburg and Southern Railroad, a shortline in North Carolina, added a repair facility to renovate used boxcars. Most car damage is caused by load shifts that bulge ends and sides.

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W. S. Jones, the railroad's VP, came up with practical repair for these inside dents. He suggested using a coupled box-

car, as a push point for a Power Team RD10013, 100 ton hydraulic ram, to repair damaged ends.

The 13-1/2 in. stroke ram is powered by a Power Team PG1204S gas engine powered hydraulic pump. The ram readily accepts fixtures and extensions to facilitate the repairs.

> I-beams are imbedded in concrete beside the rails as anchors for the ram's base during side repairs.

Marine

Big engines roll over in place with help from Power Team hydraulics

A ship's diesel engines take tremendous abuse and is heavy. That does not mean, however, that they are not easily damaged by rough handling during overhauls. The close quarters of engine rooms require that engines be installed before decks are erected over them. Therefore they are often repaired in place. "Repair work in such close quarters is akin to working on your Volkswagen in the



bathroom," according to Vern Gehring of Stewart & Stevenson, the engine rebuilders.

Deep inside the USS Clifton Sprague, 2 diesel generators required engine overhauls. Only 2-1/2 ft. of clearance from the bulkhead to the generators made engine repair difficult, at best. The 20 ft. long 1600 hp diesel engines, weighing 11,000 lbs., needed to be lifted 4-1/2 in., in tight quarters, into "Aframe" roll-over stands. The stands provided 360° access from one point. In the past, this type of lift was done using chain and block.

Ralph Pappagallo, of Kerney Ship Repair in Linden, New Jersey, the overseeing contractor, offered a better solution. Two Power Team RSS502, 50 ton rams and a Power Team P59 hand pump were specified. The rams were placed between the foundation and the center of the engine crankcase, one ram at each end of the engine. The lift took only 10 minutes to complete.

The rams continued to support repair activities during the 30-day job. Then the hydraulics helped return each engine to its bed.

Pappagallo said, "For this type of generator we always specify Power Team hydraulics. They are very good tools."



4500 foot oil rig anchor chain repaired on site using RD3006 rams

Off-shore oil exploration vessels, in the North Sea, must withstand frequent winds of 100 mph and waves of 38 ft. The K-4 grade chain, used to anchor them, is stretched out of tolerance from this constant battering. The compression-fit reinforcement bars in the anchor chain, links become loose over time and cannot be welded. Every 4 years the chains are inspected. If they do not pass, eight new, 180-ton, 35,000 link, 4500-ft. chains can cost \$3.25 million to replace and take months to get. While waiting for these chains the vessel is tied up in port.

HER Group of Aberdeen, Scotland, developed a mobile hydraulic unit to inspect and repair the chains. Stuart Gibb, managing director for HER, said, "We saw many expensive chains discarded after 5 years' use. Given the cost of these chains, we believed there was a need for a system to restore the chains rather than discard them."

Gibb also said, "We had a major order come in with a one week deadline". He said that they needed more speed than their existing hydraulics could provide. Meeting the deadline seemed unlikely. "Power Team sales representatives worked around the clock to design a system," Gibb said. And, "Power Team was the only one who had the right equipment on the shelf. They had the speed, power and back-up we needed to devise a new, successful unit in one week".

After cleaning and inspection the links are set up in special

tooling inside the repair unit. Power Team high capacity PE2004S pumps and RD3006 rams force the loose reinforcement studs back into proper position and a tight fit in the links, restoring acceptable dimensions. The unit can restore 40 to 50 links per hour.



Buckled stern of frigate jacked true with 20 100 ton aluminum rams

The 455 ft., 37,000 ton frigate, U.S.S. Samuel B. Roberts, was back in dry-dock at Bath Iron Works (BIW), where it was built in 1985. An Iranian mine in the Persian Gulf blew a 20 ft. hole in the ship. The blast, helped along by subsequent sea damage, had buckled the ship downward by 36 in., folding it about 130 ft. in from the stern. To repair the damage, BIW needed to cut the hull through all the way to the main deck, jack the stern into perfect alignment and repair the damage. This was to be the largest lift ever for the Maine shipbuilder.

BIW chose to use 20 aluminum Power Team RA1006, 100 ton hydraulic rams. They had experience with the 49-1/2 lb. rams, which had proven to be extremely reliable at approximately half the weight of steel rams. One

electrically driven Power Team PE172 10,000 psi hydraulic pump powered 2 rams for each of the 10 jacking stools, fastened beneath the stern. Operators raised the stern in small increments, re-cribbing as they went. Radio communications between crews kept everyone together.

BIW credited much of the lift's success to a Power Team planning and execution seminar, conducted by a Power Team applications engineer and the district manager. A share of the success could also be attributed to pretesting the equipment.

Marine

265 foot show boat launched with help from electric powered hydraulics

The Branson Belle, a project of international superstar Kenny Rogers and Silver Dollar City, was placed in the hands of John Dismer, president of On Site Marine. The boat was to be as long as a football field and four decks high. On Site Marine built the Belle's hull and the first two of the four decks on lakeshore instead of in a shipyard. When this phase of construction was done, the unfinished 1000 ton 265 ft.-long 74 ft. wide stern-wheel riverboat was launched into Table Rock Lake with the usual fanfare and the help of Power Team Hydraulics.

For the sideways launch, steel "ways" were positioned under the shoring

and out into the water at 3 points along the hull. Launch timbers were installed, and the ways were lubricated with bananas.

The hull was lifted in fore and aft stages using 10 Power Team C7513C, 75 ton spring-return hydraulic rams. The rams were connected to a single manifold with shut off valves and quick disconnects. They were driven by a single Power Team PE553 electric pump. The PE553 was chosen because it starts easily under load with the poor power conditions that are common at the end of long extension cords.

"The Power Team equipment was perfect," said Dismer. "It did exactly

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what it was supposed to do."







Undersea oil pipeline tree valve remotely opened with RH606 center hole ram

Control problems for offshore wells, deep under the sea, can result in costly repairs and lost production. Undersea valve trees, typically in 1000 ft. of sea water, "fail to the closed position" for safety reasons when they lose the signal from the surface. Repairs necessary to open them and restore production often required an off-shore rig and crew at \$50,000/day or more. Lost production can cost even more.

Oceaneering International supplies manned and remotely operated vehicles and equipment to solve just such undersea problems. Oceaneering Intervention Engineering (OIE), a division of Oceaneering International, designed a linear gate valve actuator system (LGVA), using Power Team's RH606 60-ton center hole, single action, spring return hydraulic ram. It simplifies backup operation

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of the valves in the event of a control system failure.

OIE attaches special docking fixtures to each of the tree's eleven valves. The LGVA is "flown" to the tree in a remotely operated vehicle. "The Power Team ram's center hole allowed us to develop a tool to mechanically lock the valve open," said Carl Barrett, OIE engineer.



Test/Quality Assurance

Earthquake force is duplicated using **Power Team hydraulics**

Hollow clay tiled construction with infilled walls was common during and just after World War II. Many of these buildings are still in existence in quake prone areas. Built before building codes required earthquake proof construction, there is no information about their resistance to the forces common in major quakes.

Dr. Max Porter, professor of Civil & Construction Engineering at Iowa State University, is in charge of a study to measure the strength and stiffness of hollow clay tile infilled walls. Said Dr. Porter, "We need to know just how much lateral force - the kind caused by earthquakes hollow clay tile buildings can take. If they can't take the force, we need to learn how we can retrofit them to assist their lateral loadcarrying ability."

Four Power Team double acting RD5513, 55 ton hydraulic rams were positioned along a clay tile wall section built to imitate an actual building's wall and its loads. A Power Team P460D, 10,000 psi hand pump powered each of the rams. For precise control and accuracy several additional steps were taken. Power Team 9596 load lowering valves and 9580 check valves were added to provide repeatable forces. Displacement gauges measured movement, and Power Team 9052 pressure gauges monitored pressure. The tiles were individually mapped, and observers closely monitored the wall during the tests. Four months of preparation culminated in 29 hours of intense work.

According to Porter, "(The tests indicate that) the walls can hold up better than expected in terms of ductility. Now we have preliminary information on strength and stiffness."



Hydraulic press meets precision tolerances for delicate parts rework

Some of the parts produced in a screw machine needed to be straightened after machining because of variances in the stock received from the mills. According to Pete Anderson, a supervisor at Bystrom Bros. Inc., the process could be delicate and fairly complex.

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Anderson designed a custom press for this precision process using a Power Team C106C 10 ton hydraulic ram. The press is powered by a Power Team PQ203 Quiet Pump. Fixtures can hold up to 1-1/2 in. in diameter by 30 in. long parts.

A Power Team 9576 three-way, three-position

metering valve provides precise control of the ram to .0001 inch tolerance for advance, hold and retract operations.

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According to Anderson, the press has performed trouble-free since it was installed and he plans to add a second one.



Tru-Tec Division is a company specializing in refinery and chemical process diagnostics. One regimen, called Mean Residence Time (MRT), uses radioactive tracer materials to determine how long it takes for fluids to dissipate in a specific chemical reactor. The material is dissolved in a carrier fluid and injected into the system. Radiation detectors determine the dispersal rate.

Mike Flenniken, a project engineer for Tru-Tec, modified an injection method to use hydraulic pumps. His first attempt

using a hand pump had less than the desired results. Back splash produced caused a spill with high radiation exposure. What he needed was a pump that could safely deliver a variety of materials.

The pump also needed to be efficient and mobile. It would be carried throughout the United States. "We chose Power Team equipment," Flenniken said, "because it is dependable, the most compact and lightweight. We needed that for transport."

He selected a Power Team PA50 hydraulic pump. It is powered by air pressure, is foot actuated and easily pumps the tracer oil into the reaction vessel.

For MRT studies in oil refineries, motor oil is used for the carrier. In aqueous systems, glycerin can be used.

Flenniken also uses the Power Team pump for heat exchanger tests, leak tests, and flow rate measurements. "Power Team Hydraulics help me to conduct the tests more efficiently and safely." he said.

Heater insulation is tested with high voltage and Power Team hydraulics

Super-conducting electro-magnets, of the type used in levitating trains and other hi-power scientific applications, must be cooled to $-452^{\circ}F$ (4° kelvin) in order to work. When they are turned off, they must be warmed to room temperature.

Sheldahl of Northfield, Minnesota, manufacturers, among other things, flexible printed circuits. They make the strip heaters that warm the magnets. According to Sue Claude, a marketing/applications engineer at Sheldahl, the heaters will be exposed to the magnet's 2000 volts. They must be tested, under operating level mechanical stress, for insulation integrity. A failure in the heater's insulation could short the magnets.

The test fixture uses a Power Team RLS1500S 150 ton ram with a 9/16 in. stroke. The ram is powered by a Power Team PE464S pump. A timing circuit helps automate the tests. Under 10,000 psi mechanical pressure the strip is subjected to 2000 volts. Heaters that fail testing are rejected.



Power Team Design Criteria and Quality Assurance

Design Criteria

All Power Team brand hydraulic components are designed and/or tested to be safe for use at maximum operating pressures of 10,000 PSI unless otherwise specifically noted.

Quality Assurance

Power Team products have a Lifetime Marathon Warranty on all materials and workmanship. All of our products are subjected to thorough quality checks during production. Steel bar stock used to make each ram body is magneticparticle inspected or eddy-current tested, both at the steel mill and by Power Team. Before leaving the factory, every ram is pressure tested to 12,500 PSI to insure on-the-job reliability.

International Standards

The following standards have been created so that people everywhere, who may not know the quality of a company, can rely on the assurances of an industry. Most aspects of these standards mirror Power Team's traditional commitment to you, our customer.

ISO 9001

Power Team is now certified for ISO 9001 international quality standards. ISO 9001 is the most stringent of five quality standards developed by the ISO Technical Committee. It requires compliance with standards for management, administration, product development, and manufacturing. Registration verifies that Power Team has adopted and maintains documentation for a variety of processes from the suppliers through to the customers, including inspection, handling, and training. ISO 9001 also requires periodic internal and external audits to ensure that all aspects of work affecting quality control are monitored.

ANSI B30.1

Power Team hydraulic rams fully comply with the criteria set forth in the American National Standards Institute standard ANSI B30.1. To meet B30.1 requirements we require the rams to meet one or both of the following criteria:

1. Rams designed to have a minimum of a 2-to-1 safety factor on typical material yield strength.

2. Each ram design is operated through a minimum of 10 cycles of full travel at 110 percent of rated load, and pressurized three times at 150 percent of pressure with the ram extended to approximately 90 percent of its full stroke, after which the ram must be functional at its rated load for its full stroke and be free of leaks.

ANSI B40.1

Power Team heavy-duty pressure gauges are designed in accordance with the recommendations set forth in the American National Standards Institute standard ANSI B40.1, Grade B.

IJ100

Power Team hoses meet the criteria set forth in the Material Handling Institute's specification #IJ100 for hydraulic hose. Under the procedures outlined in the standard, hydraulic hose shall:

- 1. Have an average minimum life of 30,000 cycles at full rated capacity.
- 2. Have a minimum burst pressure of at least twice the rated operating pressure.

CSA

Where specified, Power Team electric power pump assemblies meet the design, assembly, and test requirements of the Canadian Standards Association. Note: If CSA certification is required, it must be requested at the time the pump is ordered.

NEMA

Where specified, Power Team electric power pump assemblies meet the design, assembly, and test requirements of NEMA 12, a National Electrical Manufacturers' Association standard relating to electrical components used to resist moisture and dust.

Our Customers

Our customers are our best source for innovation. We hope that this book will inspire you to use Power Team products in new and innovative ways to solve your common or not so common problems. If your application requires the quality and economy of Power Team, please call your local Power Team industrial distributor or contact our sales department.

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