

PUSH PULL

DAWSON

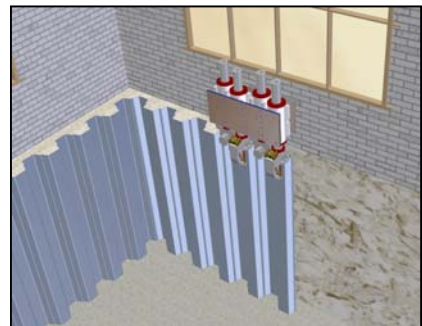
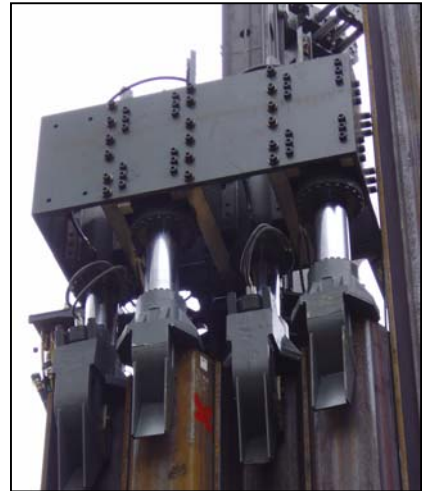
INNOVATIVE PILING EQUIPMENT



Quiet, vibration-less installation and removal of steel sheet and foundation piles

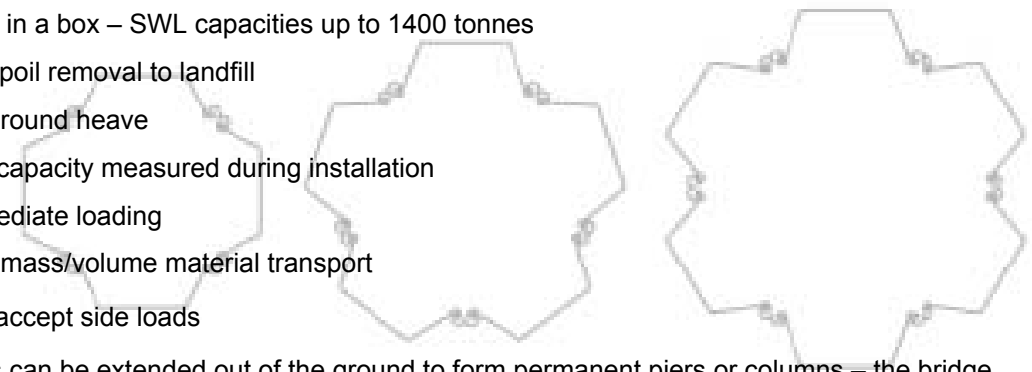
Push-Pull Sheet Piling – The Principal Advantages

- Quiet and vibration-less
- Powerful Push-Pull force of up to 200 tonnes for effective installation and extraction
- Fast installation or extraction rates deliver high productivity and economy
- Readily configured to suit Z, U & H-pile profiles in groups of between 2 to 6
- No reaction frame required to start pile installation – unlike conventional pile presses
- Corner piles easily installed without reaction frame
- Offers truly recyclable foundation solutions
- Standard Z-piles can be installed close to property boundaries – maximise development footprint
- Leader guided operation reduces interlock friction and produces high quality, accurate installations
- Piles can be removed, returning site to original 'greenfield' condition
- Piles can be threaded without the use of a crane



Push-Pull Foundation Pile Advantages – in addition to the above

- Can be configured to install high capacity foundation piles formed by interlocking 4, 5 or 6 sheet piles in a box – SWL capacities up to 1400 tonnes
- No spoil removal to landfill
- No ground heave
- Pile capacity measured during installation
- Immediate loading
- Low mass/volume material transport
- Will accept side loads
- Piles can be extended out of the ground to form permanent piers or columns – the bridge construction shown below is a good example

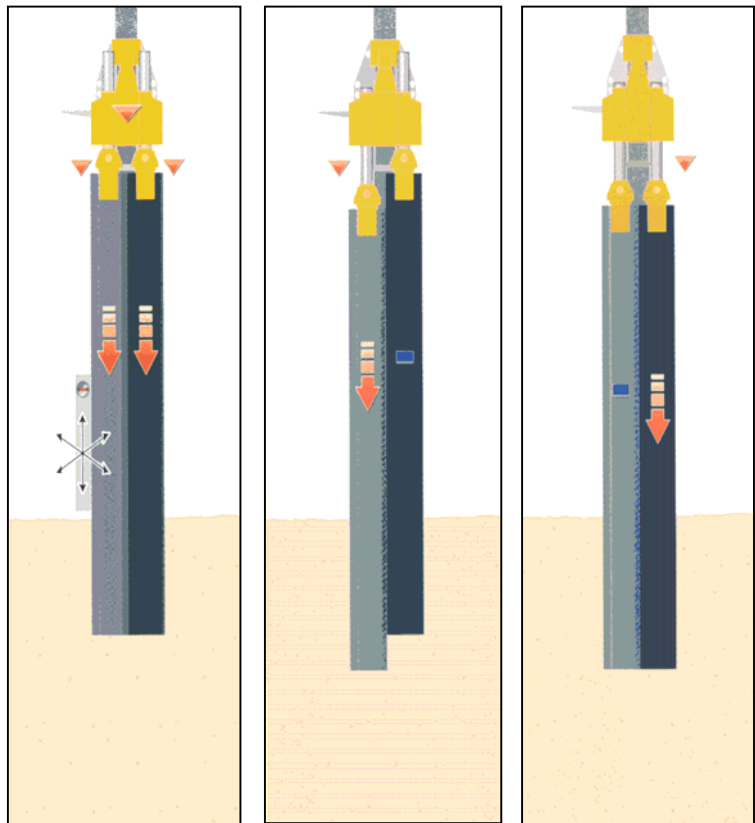


The Dawson Push-Pull concept

Powerful hydraulic clamps take hold of the tops of several interlocked steel sheet piles. The piling rig then applies down-crowd force, pushing ALL piles until the rig reaches its safe load limit. This usually achieves several metres of penetration.

Maintaining this initial pre-load the hydraulic Push-Pull cylinders then apply vertical force to a single sheet pile whilst reacting on the rest of the pile group.

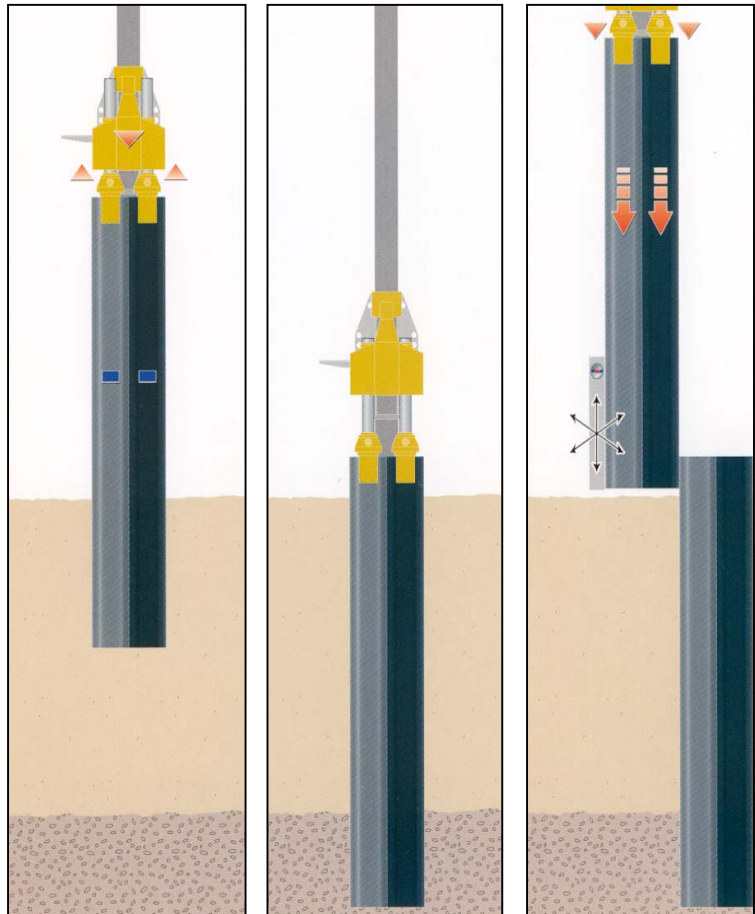
This downward force requires an equal and opposite reaction. Initially, most of this reaction is provided by the combined weight of the piling rig and the reaction piles. However, as penetration of the pile group advances the skin friction between the reaction piles and the ground becomes the most significant factor in developing adequate total reaction.



Once all piles in the group are advanced by the full stroke of all Push-Pull cylinders, the entire pressing device retracts, ready to repeat the cycle. This simple process is the same irrespective of the total number of Push-Pull cylinders.

With the pile group fully installed the next group can be positioned and the whole process is repeated.

The rigid leader provides perfect pile alignment minimising interlock friction and producing a high quality installation. Unlike conventional presses there is no need to build a temporary reaction frame to start the first sheet piles.



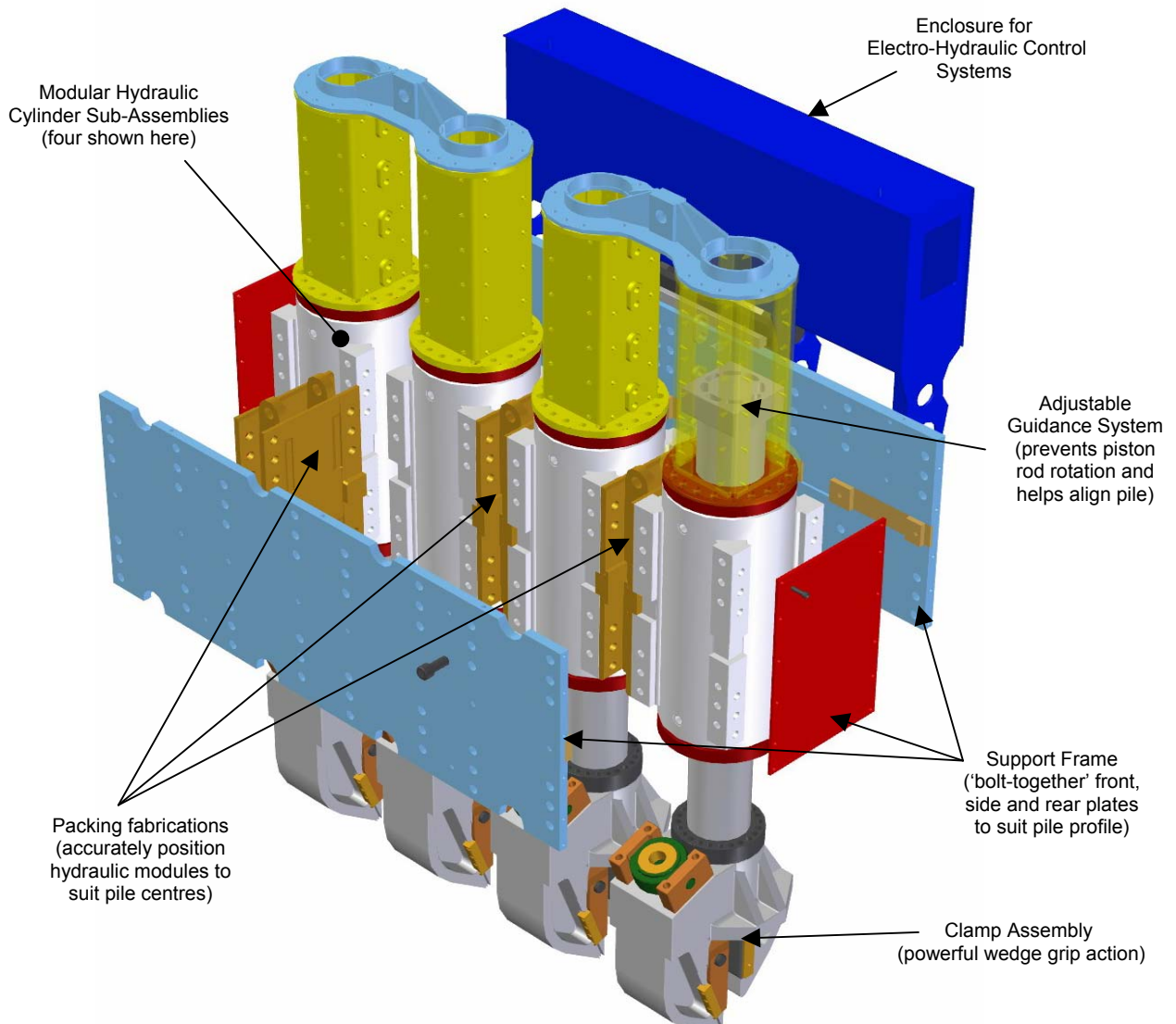
Pile Extraction

Sheet pile extraction is simply undertaken in reverse order to that described above. The piling rig provides a maintained upward force on the press assembly with one or several Push-Pull cylinders providing the upward extraction force on a single pile.

Basic Push-Pull Equipment Features

The Dawson Push-Pull concept offers the possibility to install and remove steel sheet piles and foundation piles without significant noise or ground vibrations. Typically installed on a modern, efficient, powerful hydraulic piling rig the complete system can be rapidly deployed to site, set up in a few hours and undertake the required piling operation accurately, productively and safely.

Typical 4-Cylinder Push-Pull configuration



As with all good ideas the basic concept is simple. Any given Push-Pull machine, or press assembly, consists of a number of modular hydraulic cylinder sub-assemblies. These modules consist of powerful double-acting, double-ended hydraulic push-pull cylinders with a clamp assembly mounted on the bottom of the lower piston rod together with an adjustable guidance system surrounding the upper piston rod. These modules are arranged within a simple 'bolt-together' support frame so as to accurately position the relevant number of modules directly over the centres of each pile in the group that is to be installed – the number of piles in a group typically ranging from 2 to 6.

Support frames can be engineered to accommodate practically all existing steel sheet piles and as steel mills introduce an ever increasing, ever widening, range of profiles alternative frames can be readily supplied, ensuring today's investment is good for many years to come. They can also be engineered to work with larger groups of piles whether configured to be in-line or as a multiple pile cluster or box.

Push-Pull Integration with a Piling Rig - General Guidelines

Dawson Push-Pull systems have been designed to readily integrate with a range of piling rigs. There are a number of essential features required of any potential rig but invariably some rigs will be more suited as a carrier for the Dawson Push-Pull than others. Some will require little more than engineering adjustment, whilst others may prove more demanding. A few rigs are simply not suitable! Please consult Dawson's engineering department to discuss specific applications.

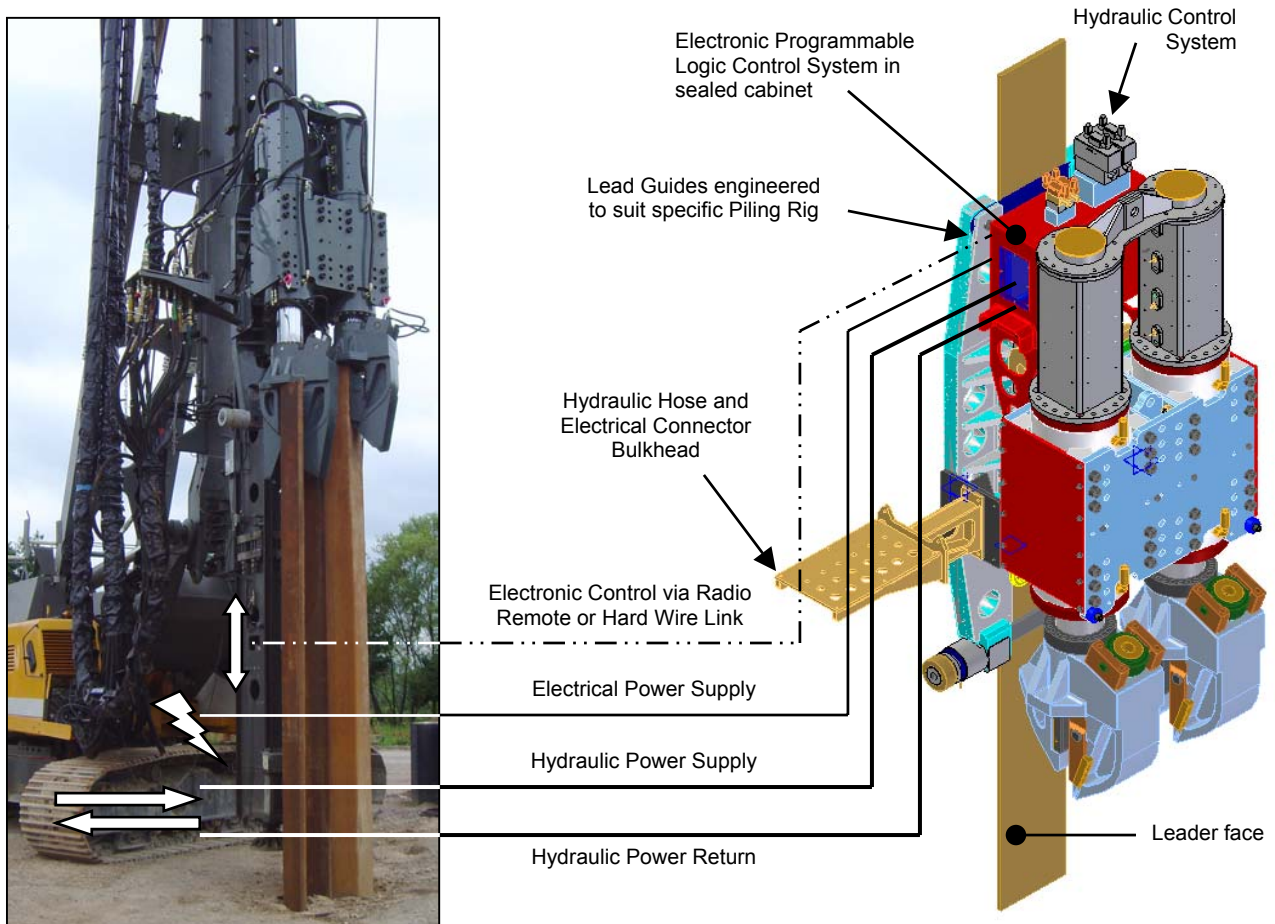
What is the ideal piling rig for a Dawson Push-Pull system?

The piling rig should be based on a hydraulic carrier either with sufficient installed hydraulic power or the ability to carry an additional suitable power pack. It should be capable of handling the total weight of the specific Push-Pull press AND relevant sheet piles, within its safe operating parameters – consider both rig stability and ground pressure.

The rig should be able to impart between 20 and 50 tonnes of down-crowd or extraction force to the Push-Pull unit over the entire pile installation length. Often this means over the entire lead length. This usually requires the lead to be rigidly mounted to the base machine - hanging leads do not transfer the reaction weight of the rig to the press.

The Push-Pull unit will incorporate Hydraulic and Electronic Control Systems on board. This simplifies connection with the piling rig and can permit full or partial integration with its electronic control and data logging systems e.g. Liebherr's range of LRB Piling and Drilling Rigs. Subsequently, operator control can be achieved via the rigs standard control panel or through a separate Dawson control pendant that can either be hard wired directly to the Push-Pull unit or set to function by wireless radio remote.

A good example of suitable Push-Pull piling rigs would be those supplied by Liebherr-Werk, Nenzing, Austria. Pictured below is a 2-Cylinder Push-Pull operating a Liebherr model LRB155 Piling & Drilling Rig.

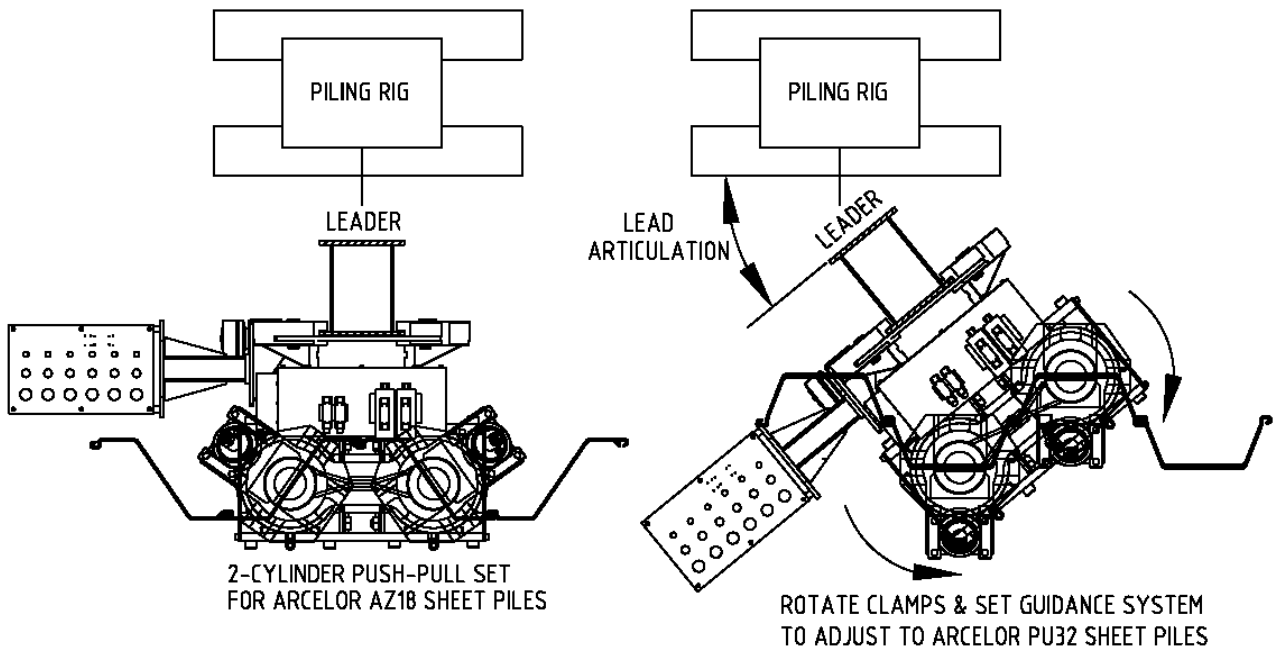


Leader Articulation

The leader should have the ability to articulate or pivot (in plan view). This is typical of any rig that has been engineered to undertake sheet-piling work - though alternative arrangements can be supplied. This feature offers two significant operational benefits:

- The entire piling process is faster, more economic and safer when the operator has the ability to see what he is doing. Lead articulation means the operator can position the leader for good visibility with minimum track movement.
- The 2-Cylinder Push-Pull unit can accommodate numerous pile profiles simply by articulating the lead and/or adjusting the rotational settings of the individual cylinder assemblies.

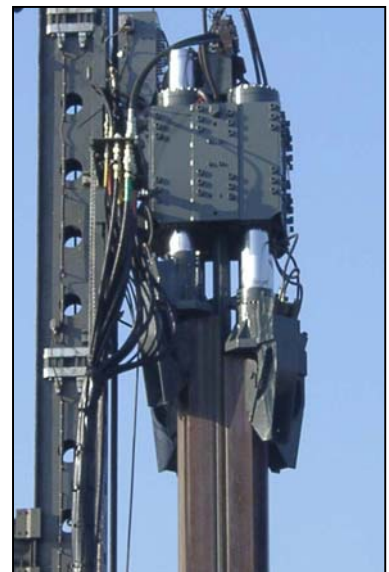
The example below shows the same 2-Cylinder Push-Pull unit working with Arcelor AZ18 and PU32 steel sheet piles. The centres of the two Modular Hydraulic Cylinder Sub-Assemblies remains the same, but the Adjustable Guidance System is altered to correctly align the Clamp Assemblies with the clamping faces of each pile



2 Cylinder Push-Pull on Liebherr LRB 155 piling rig installing U & Z-piles - Germany



4 Cylinder Push-Pull on Liebherr LRB 255 piling rig installing U-piles - UK

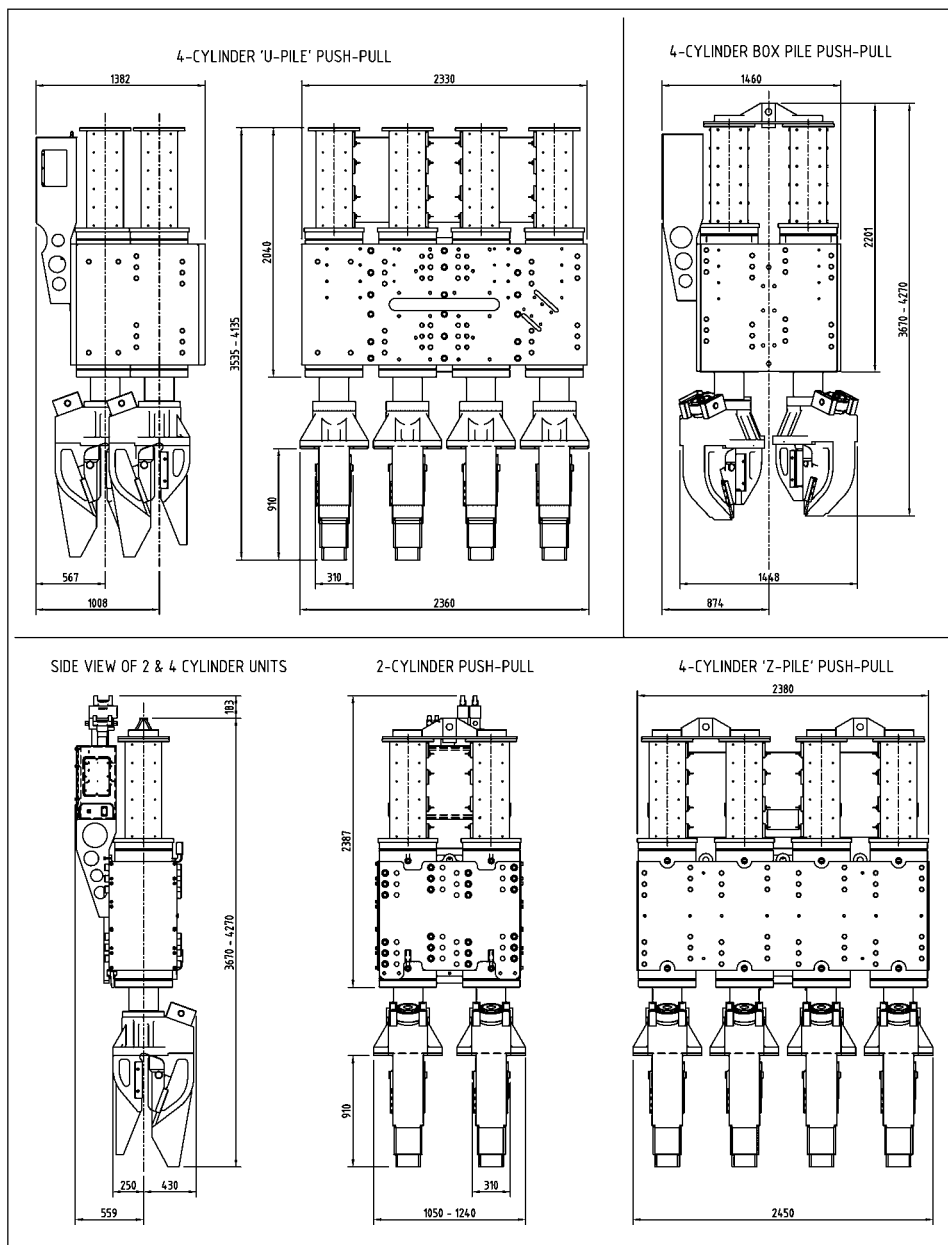


4 Cylinder Push-Pull Foundation Box Pile on Liebherr LRB255 - UK

Technical Specifications

| Specification | Units | Push-Pull Type | | | |
|--------------------------------------|------------|------------------------|---------------------|---------------------|---------------------|
| | | 2~Cylinder U & Z-piles | 4~Cylinder Z- piles | 4~Cylinder U- piles | 4~Cylinder Box Pile |
| Pressing Force per Cylinder | kN | 2,078 | 2,078 | 2,078 | 2,078 |
| | tons (US) | 233 | 233 | 233 | 233 |
| Extraction Force per Cylinder | kN | 2,078 | 2,078 | 2,078 | 2,078 |
| | tons (US) | 233 | 233 | 233 | 233 |
| Maximum Cylinder Advance Distance | mm | 600 | 600 | 600 | 600 |
| | in | 23.6 | 23.6 | 23.6 | 23.6 |
| Cylinder Advance Rate | mm/min | 5,890 | 5,890 | 5,890 | 5,890 |
| | in/min | 232 | 232 | 232 | 232 |
| Weight* | kg | 7,000 | 13,000 | 13,000 | 13,000 |
| | lbs | 15,430 | 28,650 | 28,650 | 28,650 |
| Required Hydraulic Pressure | bar | 350 | 350 | 350 | 350 |
| | psi | 5,075 | 5,075 | 5,075 | 5,075 |
| Minimum Required Hydraulic Flow Rate | l/min | 350 | 350 | 350 | 350 |
| | gpm (US) | 93 | 93 | 93 | 93 |
| Electrical Supply | Volts/Amps | 24DC/10A | 24DC/15A | 24DC/15A | 24DC/15A |

Weight will vary depending on leader mounting arrangements.*



What Pile Sections?

Unlike conventional pressing equipment the Dawson Push-Pull units can be configured to suit a considerable range of U or Z steel sheet pile profiles of varying widths working with two or more sheets at a time. Whilst a 4-Cylinder Larssen Push-Pull may not be readily used on a line of Z-piles, the basic Hydraulic Modules can be reconfigured with replacement support frames at minimal cost. The same is true if the steel mills launch new wider sheet pile profiles in the future. This flexibility means that the modern contractor can invest in such equipment with the confidence that it will be good for tomorrow's work.

A given Push-Pull unit is likely to be manufactured for a specific customer utilising a particular piling rig. The piling rig may impart specific limitations on the range of pile sections that can be installed.

It is possible for a given Push-Pull unit to accommodate a given pile section in more than one-way. For example, the 2-Cylinder Push-Pull can be set with the basic Hydraulic Modules at two different widths, 680 & 585mm. A Hoesch Larssen 603 can be installed with the press set at 680 or 585mm.

Given so many permutations, Dawson does not consider it practical to summarise precisely what pile sections can be installed with what press in this documentation. Each Push-Pull is supplied with a complete set of manuals including a sheet pile application manual that clearly shows specific pile interaction details for that unit.

The table below gives some examples of what each press can install, but **this is a limited list**. Please check with Dawson Construction Plant Ltd, or an authorised distributor, regarding specific project requirements before undertaking work.

| Pile Manufacturer | Profile | 2-Cylinder U & Z-Piles | 4-Cylinder U-Piles | 4-Cylinder Z-piles |
|-------------------|-----------------|------------------------|--------------------|--------------------|
| Arcelor | PU6 | √ | √ | X |
| | PU8 | √ | √ | X |
| | PU12 | √ | √ | X |
| | PU16 | √ | √ | X |
| | PU20 | √ | √ | X |
| | PU25 | √ | √ | X |
| | PU32 | √ | √ | X |
| | AZ13 | √ | X | √ |
| | AZ18 | √ | X | √ |
| | AZ26 | √ | X | √ |
| | AZ36 | √ | X | √ |
| | AZ48/50 | √ | X | √ |
| Hoesch | 600 | √ | √ | X |
| | 601 | √ | √ | X |
| | 602 | √ | √ | X |
| | 603 | √ | √ | X |
| | 604 | √ | √ | X |
| | 605 | √ | √ | X |
| | 606 | √ | √ | X |
| | 607 | √ | √ | X |
| | H1200k | √ | X | √ |
| | H1700k | √ | X | √ |
| | H2500k | √ | X | √ |
| | H3600 | √ | X | √ |
| | Nucor/Chaparral | PZ22 | √ | X |
| PZ27 | | X | X | X |
| PZ35 | | √ | X | X |

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