

Site Requirements and Gravel Pad Preparation for Zedi SilverJack 8000 with Concrete Pad

Customer Responsibilities

Confirm Installation Date

The Customer must contact Zedi to confirm the date and time of installation 3-5 days prior to the installation. This allows Zedi to coordinate all necessary parts and contractors to ensure a smooth Zedi SilverJack 8000 (SJ8000) installation.

Compatibility of Downhole Equipment and Surface Equipment

Downhole equipment must be designed to and compatible with the surface equipment specifications. This includes the barrel length of the downhole pump, downhole pump size, polished rod size, polished rod liner size etc. For example, if a 240" stroke SJ8000 is installed on a well with a 168" downhole pump, the SJ8000 could unseat the pump.

All Site Preparation is Completed Prior to Zedi Arrival

- All obstacles must be cleared around the wellhead and work area to accommodate the SJ8000 and to ensure a safe work area. This may include the following if applicable.
 - The chemical tank must be moved away from the gravel pad area so the gravel pad and concrete pad can be placed by the wellhead.
 - All existing artificial lift equipment (such as pumpjack, ESP or PCP) equipment must be removed. This includes cable trays and controls.
 - The portable walk around the wellhead must be removed.
- A gravel pad should be constructed to the specifications laid out in the next section below. Failure to follow proper gravel pad preparations may result in equipment issues and damage.
- Ensure that the appropriate SJ8000 Support Structure (Concrete Pad Version) will be installed.
 - If the **wellhead has a height of 5' or less**, then a gravel pad must be prepared for the SJ8000 **Short** Support Structure for Concrete Pad.
 - If the **wellhead has a height of 5' to 9'**, then a gravel pad must be prepared for the SJ8000 **Tall** Support Structure for Concrete Pad.
 - If the wellhead is over 9' tall, then do not construct the gravel pad as instructed in this document. Instead, install four piles along with the SJ8000 Support Structure for Piles.
 - If the wellhead is inside a well cellar, then do not construct the gravel pad as instructed in this document. Instead, install four piles along with the SJ8000 Wide Support Structure for Piles.
- The rest of the site must be graded downhill from the gravel pad and wellhead to allow for proper runoff. This ensures that the gravel pad does not wash away in the event of rain or snow melt.
- Leave 3 to 6 feet of polished rod stickup above the wellhead assembly. This may be above the stuffing box or polished rod liner clamps, depending on the wellhead.
- If the Customer ordered an AC Electric Powerpack, prepare the power on site. 3-phase 480V AC power is required for the SJ8000 starter panel. Provide a certified electrician for the wiring.

- If the Customer ordered a Gas (Multi-Fuel) Powerpack:
 - Provide propane, pressure regulator and propane hose on site; or
 - Provide pressure regulator and labour to plumb fuel gas line into the Powerpack.
- Provide 2 proper sized rod clamps.

Gravel Pad is Prepared Prior to Zedi Arrival

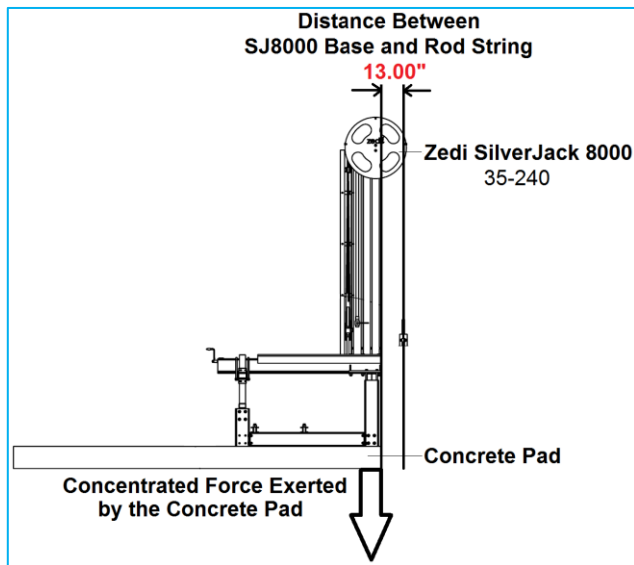
Ensure that the ground beside the wellhead where the SJ8000 Support Structure will be constructed is solid and compacted. If the ground has been disturbed or is not native ground, then compact the ground using a tamping machine or compactor for proper.

Depending on the SJ8000 Support Structure model and the height of the wellhead, you may need to prepare a gravel pad.

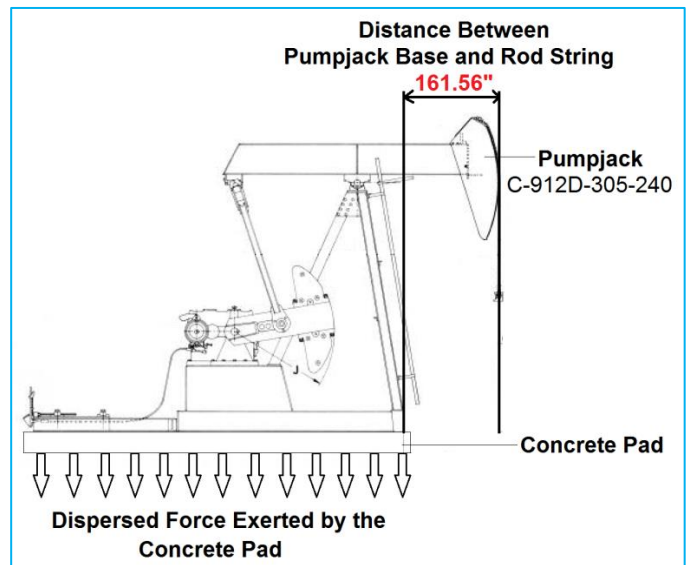
- If you are installing the **Short Support Structure**, then the vertical distance between the ground and the top of the wellhead assembly must be 45" or less. If the distance is more than 45", then construct a gravel pad to shorten this distance.
- If you are installing the **Tall Support Structure**, then the vertical distance between the ground and the top of the wellhead assembly must be 85" or less. If the distance is more than 85", then construct a gravel pad to shorten this distance.

The gravel pad should consist of a mixture of aggregate with earth fines and be considered compactable material. It must be solid and properly compacted so that the gravel pad does not slump. Forms may be used to maintain shape and prevent slumping.

The gravel pad must be compacted very well especially on the front edge closest to the wellhead due to the concentrated forces felt only 13" away from the rod string directly below the SJ8000 Lift System. This is not the same as a pad preparation for a pumpjack because a pumpjack is 130" to 170" away from the rod string with its forces dispersed throughout the bottom of its concrete pad (as seen in the following figures). An insufficiently compacted gravel pad may cause the front edge of the concrete pad to sink into the gravel towards the wellhead.



Concentrated downward force below the SJ8000 at only 13" from the rod string



Dispersed downward force below a conventional 912 pumpjack at 161.56" from the rod string

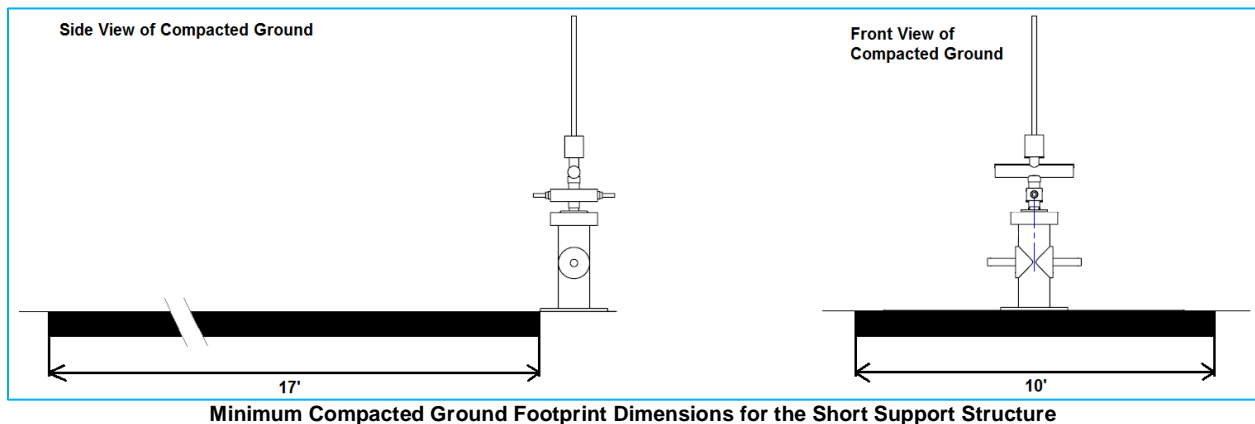
The following section describes a typical gravel pad preparation procedure that may be followed. However, optimal gravel pad preparation may vary in different climates and environments. The following procedure is only a recommendation.

Gravel Pad Preparation Example



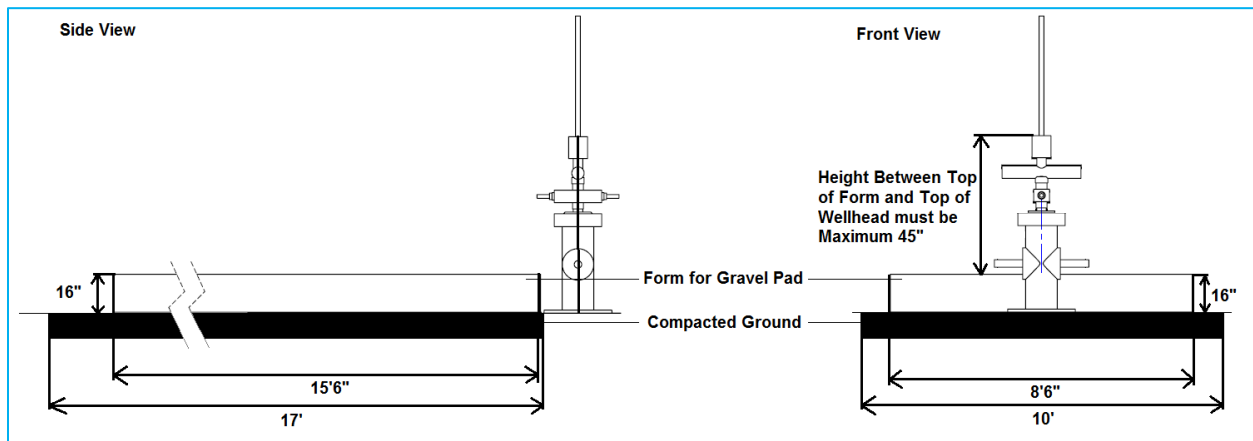
This procedure is an example of a typical gravel pad appropriate for the SJ8000 installation. However, optimal gravel pad preparation may vary in different climates and environments. Consult local regulations and engineering consultants for the ideal gravel pad design for your location.

1. Ensure that the ground beside the wellhead where the gravel pad will be constructed is solid and compacted. If the ground has been disturbed in any way or is not native ground then follow these steps to compact the ground with a tamping machine or compactor before starting construction of the gravel pad.
 - a. If the natural ground soil is not a well compacting earth then consider installing piles with the SJ8000 Support Structure designed for piles. Another option is to remove the non-compactable or weak compacting soil until you reach earth that is suitable for good compaction.
 - b. Apply moisture to the ground.
 - c. Apply a tamping machine or compactor over the entire footprint of the gravel pad location. This ground should be compacted a minimum of 2' wider and longer than the SJ8000 Concrete Pad, which will be placed on top of the gravel pad.
 - i. If you are installing the **Short** Support Structure, then compact a **minimum 10'x17' footprint** (with the 10'-side beside and centered to the wellhead). The SJ8000 Concrete Pad for the Short Support Structure has an 8'x15' footprint.
 - ii. If you are installing the **Tall** Support Structure, then compact a **minimum 10'x20'9" footprint** (with the 10'-side beside and centered to the wellhead). The SJ8000 Concrete Pad for the Tall Support Structure has an 8'x18'9" footprint.
 - d. Add soil as required in the tamping or compacting process to fill in large holes or depressions.
 - e. Ensure that the compacted ground is as close to the wellhead as possible.



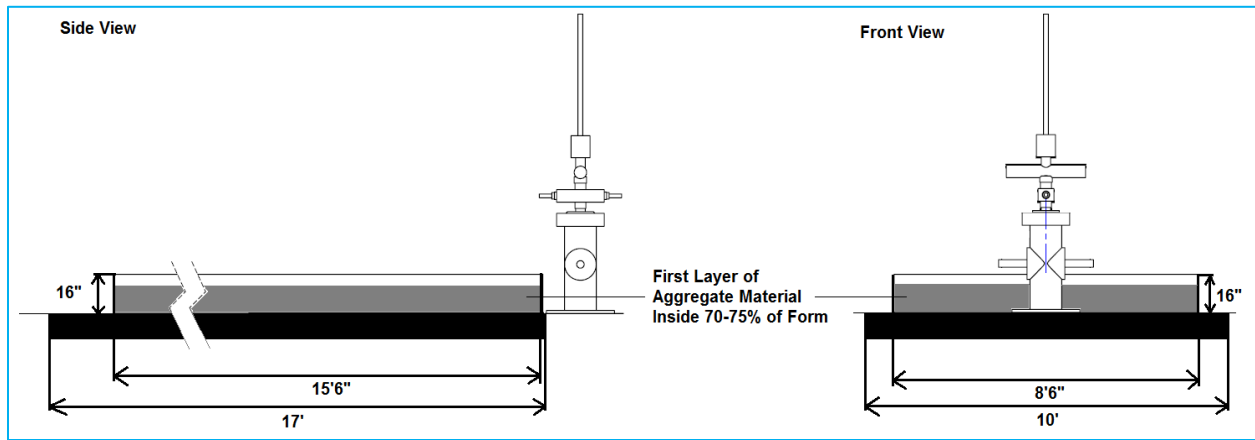
2. Ensure that the surrounding ground is sloped downhill from the compacted ground and wellhead so that rain and snow melt drain away from the wellhead and gravel pad.
3. Build a form on the compacted ground to contain the gravel pad.
 - a. Build the form to the same height as the gravel pad. The form ensures that the gravel (compactable aggregate with earth fines) stays underneath the SJ8000 Concrete Pad and does not spread or move.
 - b. Build the form with a **maximum height of 16"**. If the gravel pad is already at 16" and one of the following criteria is not met, then ground piles should be considered for the installation instead of the gravel pad.
 - i. If you are installing the **Short** Support Structure, then there **must not be more than 45" of height** between the top of the form to the top of the wellhead assembly.

- ii. If you are installing the **Tall** Support Structure, then there **must not be more than 85" of height** between the top of the form to the top of the wellhead assembly.
- c. Build the form so that the gravel pad is a minimum of 6" wider and longer than the SJ8000 Concrete Pad allowing a minimum of 3" of gravel pad exposed beneath the SJ8000 Concrete Pad. This ensures good integrity underneath the SJ8000 Concrete Pad at all times.
 - i. If you are installing the **Short** Support Structure, then the gravel pad must be a **minimum 8'6"x15'6"** (with the 8'6"-side centered to the wellhead). Its SJ8000 Concrete Pad has an 8'x15' footprint.
 - ii. If you are installing the **Tall** Support Structure, then the gravel pad must be a **minimum 8'6"x19'3"** (with the 8'6"-side centered to the wellhead). Its SJ8000 Concrete Pad has an 8'x18'9" footprint.
- d. Build the form next to the wellhead so that it is not more than 2" away from the wellhead flange. The concrete pad will be eventually placed on top of the gravel pad at a maximum 2" away from the wellhead flange.



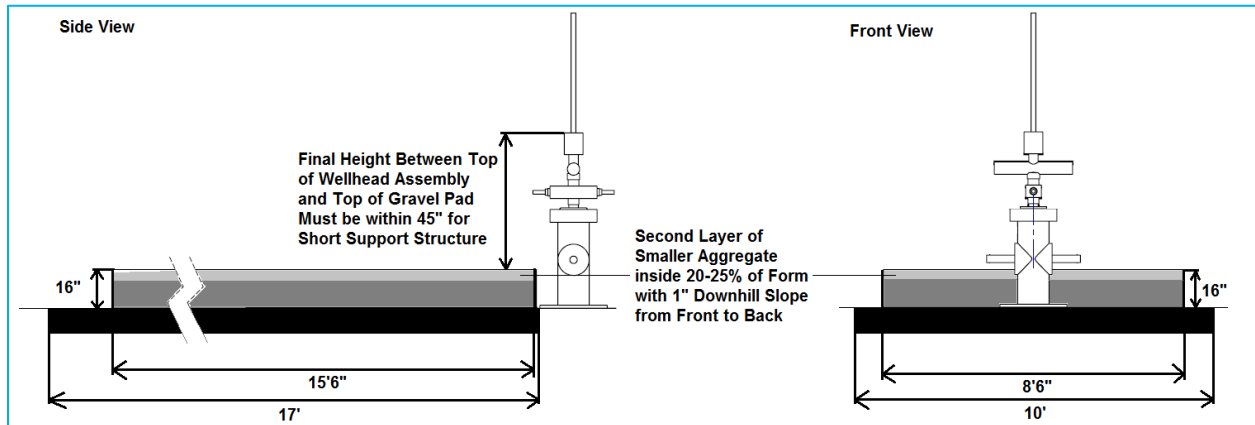
Example Form Dimensions for the Short Support Structure (Drawing Not to Scale)

- 4. Ensure that the forms are built securely so that during the gravel compacting process, the form sides stay rigid and do not push out or bend. This can be done by the following.
 - a. The forms can be wired side to side and front to back so that the width and length of the forms maintain their structure when gravel is compacted inside the form.
 - b. The forms can be secured from the outside of the forms with several solid stakes pounded into the ground.
 - c. If during the compacting process the forms push out, then the staking or wiring must be repeated or changed to maintain the integrity of the form's shape.
 - d. If forms are nailed together, then add reinforcements at the nailed edges outside of the form so that the nails do not push out thus collapsing the form once compacting has been completed.
- 5. Build the first layer of gravel pad inside the form using an aggregate material.
 - a. The first layer should be 70% to 75% of the overall gravel pad height. For example, a 12"-high gravel pad should have 9" of this first layer of aggregate.
 - b. The aggregate material is fractured or crushed rock (not round) and is **compactable** containing earth fines such as dirt, silt, loam and clay.
 - i. The largest fractured or crushed stones in this aggregate mix should be between 2" to 3" in diameter. This layer of large stones is optimal to distribute weight and prevent sinking into the compacted ground below.
 - c. Using a tamping machine or compactor, compact the aggregate at every 2" layer of added aggregate.



Example Height for First Layer of Gravel Pad Containing Large Aggregate

6. Build the second layer of gravel pad filling the rest of the form as follows.
 - a. The second layer should be 20 to 25% of the overall gravel pad height.
 - b. The aggregate material is fractured or crushed rock (not round) and is **compactable** containing earth fines such as dirt, silt, loam and clay.
 - i. The largest fractured or crushed stones in this aggregate mix should be no more than $\frac{3}{4}$ " in diameter.
 - c. Using a tamping machine or compactor, compact the aggregate at every 2" layer of added aggregate.
7. Grade the top surface of the gravel pad so that there is a 1" downhill slope from the front (wellhead side) to the back.



Second Layer of Gravel Pad with 1" Downhill Slope from Front to Back

8. The gravel pad must be level from side to side. The only slope present must be the 1" slope from the front to the back.
9. Once the gravel pad is complete and the concrete pad is placed on top of the gravel pad (centered to the wellhead and level side to side), pour additional gravel around the outside of both the gravel pad and cement pad. Slope this additional gravel away from top of concrete pad to the ground so that water will run off away from the concrete and gravel pad.

Ultimately there will be some final settling of the gravel pad once the concrete pad is applied and the SJ8000 is operational. Adjustments to the system to accommodate 1" of settling can be managed by the Height Adjusting Beams on the SJ8000 Support Structure. Any more settling may require reworking the gravel pad beneath the concrete pad. This is why forms must be used contain the rock thus keeping the gravel pad beneath the concrete pad.

Expenses Covered by Customer

If required, the following may be coordinated by Zedi and charged to the Customer. Contact Zedi for arrangements.

- Site preparation such as gravel, equipment, forms, and labor.
- Crane
- Shipping
- Electrician
- Presco switch(es) installed
- Hydraulic oil for N2 Storage System and extra to leave on site
- Rod clamps
- Nitrogen
- Zedi Field Technicians' SJ8000 installation labour

Zedi Responsibilities

Install SJ8000

- Organize shipping of the SJ8000 (Lift System, Concrete Pad, N2 Storage System and Powerpack)
- Supply Zedi Field Technicians for installation of all SJ8000 equipment onsite
- Torque all fasteners to manufacturer's specifications
- Hook up all hoses and cables
- If Customer ordered an AC Electric Powerpack, bump test electric motor with electrician onsite
- Charge and balance N2 Storage System with hydraulic oil and N2
- Function test all systems (Presco and other shutdowns)
- Commission site onto Zedi Access
- Go over operating procedures with Customer

Site Extras

- Customer's transmitters or switches on site may be tied into the SJ8000 Optimization Controller if requested
- Zedi may provide and/or install heat trace pumps if requested



Note

Zedi Field Services will look after the installation and coordination work flow onsite with contractors to keep the installation as efficient as possible. Any delays caused by weather or site prep will result in additional crane time, which the Customer is expected to cover.

Zedi Field Technician Contact Information

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