

# KEY ATTRIBUTES OF A PRODUCTIVE SURVEYING TEAM ON MAJOR REMOTE INFRASTRUCTURE PROJECTS



# Key Attributes of a Productive Surveying Team on Major Remote Infrastructure Projects



The typical pricing structure provided by surveying companies for services on large scale remote infrastructure projects is at hourly or day unit rates per surveyor. This would appear to make it easy to compare overall cost between surveying companies through a tender or a quotation process by comparing the unit rates against each other over the duration of the project. However, on the majority of occasions, the lowest unit rate doesn't equate to the lowest overall project cost. The leading reason for lowest unit rate not equalling the lowest overall project cost is due to a varying level of productivity between surveyors and different company's services.

This case study will aim to demonstrate some of the key factors that can contribute to a higher productivity rate and also provide an example where two similar projects were completed with a large variance in resources and overall cost and yet had a comparatively low unit rate per survey crew.

## Suitability of the provided surveyors for the scope of work

To ensure that the surveying team members are providing the best possible technical services they need to have the specific skills, training and experience to match the scope of work. Surveying is such a broad profession and there are a variety of different disciplines. It is crucial that the surveyors are suited to the scope of work. This seems like such an obvious prerequisite for any project but it is surprising to see how often surveyors, with little or no experience in the field of the project they have been assigned to, are expected to work at a highly productive level and achieve the required accuracy.

To gain the best results the team carrying out the service needs to be specialised in that discipline. The difference between earthworks surveyors and mechanical SMP surveyors is vast in their skill set. Earthworks surveyors understand that the tolerances are not as tight, but yet there are still tolerances that need to be maintained. They use this to their advantage to produce large amounts of work in the form of survey stakes/marks provided to the operators. They have a clear understanding of the requirements from the operators and where survey marks are best positioned to avoid being knocked and what marks are most useful to the operator. Conversely, mechanical SMP surveyors work to a much higher tolerance and the apparent work achieved is less, however, this is traded for accuracy. Putting each surveyor in the opposite discipline will produce an undesirable result. The earthworks surveyor may provide a huge amount of work to the detriment of the accuracy needed for Mechanical SMP structures whilst the Mechanical SMP surveyor may produce high quality accurate earthwork stakes, but hasn't been able to maintain the work load required for the machine operators. Both scenarios lead to a loss of productivity, down time, re-works and larger overall project costs.

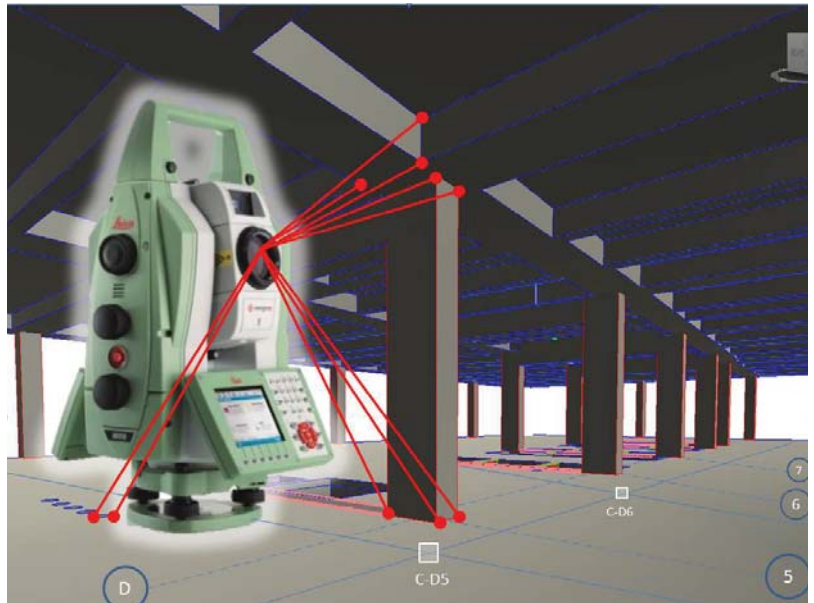


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## Surveying Technology

In addition to the ability of the surveyor another factor that is directly related to productivity on the construction site is surveying technology. With continuous improvements in technology it would be easy for surveying companies to get left behind but staying ahead of the pack is crucial to ensuring the highest productivity results. The advancements in on-board total station software provided by leading surveying equipment manufacturers have drastically reduced the time for field calculations and enabled surveyors to complete a number of tasks in the field and provide results in real time without having to analyse data and complete calculations (prior to providing these results). This information can be crucial to construction professionals to enable them to make timely decisions based on accurate survey results. For example : recently a leading manufacturer of surveying equipment released state of the art technology that combines extensive measuring capabilities combined into one piece of equipment . This “multi station” combines precise total station capabilities, digital imagery, GNSS and 3D Laser scanning. This is a revolutionary solution with advanced measuring technology that provides unchallenged accuracy and quality. Companies without access to this technology will not be able to compete at a productivity level.



## Morale of the Team Members

Having a team of dedicated professionals is critical to the success of the project. Unfortunately productivity of the surveyor is not always as simple as having the latest technology and the best ability. A major factor comes down to motivation and initiative so selecting a team that gels together is the best way to start when assigning surveyors to any project. Keeping a team together from project to project will go a long way towards achieving a high productivity rate as individuals can be assigned to the task that they excel in where they have a proven track record of results. The best teams ensure that open communication is encouraged throughout all levels of staff with scheduled toolbox meetings where opportunities for improvement are discussed regularly. In addition to this, if the employer can ensure that above industry remuneration, career development and training initiatives are provided it should result in less turnover of staff and, in turn, produce higher productivity with lower induction and training costs. Surveying companies regularly adhere to the philosophy of employing high quality senior staff and paying them at an industry level but over time a general trend has been developing to employ substandard mid-level staff without the correct skills and paying them well below industry standard as a way of undercutting the market. This will create a problem with productivity and morale within the team and is usually taken on board to increase profits without showing any concern to the effects this will have on the project. Ensuring every team member assigned has the specific skill & training required to carry out the tasks will not burden other more skilled team members with having to carry the weight of underperforming surveyors and reduce the risk of error.

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## Offsite Support Team

Having a great onsite project team is not the end of the solution. The offsite support team is required to provide essential support to ensure success for any project. It is common with some surveying companies for a team to be selected by management and subsequently mobilised with limited support and training. It is then left to the senior surveyor to provide initial setup solutions and training to lower level staff. It is important that the initial set-up of the projects is well planned prior to the mobilisation of the surveyors. It is crucial that training is provided to the project team in respect to information technology setup, health safety and environment project requirements, company document control software, company technical procedures and work method statements and a range of other aspects. If the team is expected to be trained in this information only after being mobilised to site then this will negatively impact productivity. Ongoing support from management is required throughout all phases of the project including: logistics of equipment and personnel, maintenance and offsite calibrations of surveying equipment, administration support, technical support, training scheduling on R&R, processing survey data and calculations offsite to support project team during peak periods. These are just some of the requirements that the offsite team needs to provide to their team onsite to ensure they are free to concentrate on the task at hand. There is a varying amount of support provided to onsite teams in this industry and it is crucial that the company adopts a systematic approach from project to project to ensure an efficient output from the onsite team.



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## CASE STUDY - Surveying Team Productivity Comparison - PLUTO LNG PROJECT

This case study compares surveying resources required to complete the scope of work for two similar contracts in size and scope completed on the Pluto LNG Project.

### Scope of Work 1 (Offsite & Utilities)

Pluto Onshore Mechanical Offsite Utilities and AGRU Project

**Surveying Company:** Xcel Surveying

**Scope:** The scope of work consists of module installation, mechanical equipment installation, piping, structural steel erection, testing, pre-commissioning and commissioning assistance for the Mechanical Offsite Utilities and Acid Gas Removal Unit (AGRU).

The scope includes assisting with installation of 120 modules (11T to 1,100T), approximately 100 items of mechanical equipment, (1T to 400T), 20,000 metres of piping, 700 tonnes of structural steel plus all associated hook-ups, testing and pre-commissioning.

**Duration Period:** approx. 32 months

**Overall Contract Value:** **Approx. \$170 million**

**No. of Surveyors required to complete scope at peak:** **4 onsite**



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## Scope of work 2 (LNG TRAINS)

Pluto Structural work for LNG Train and Gas Turbine Generators

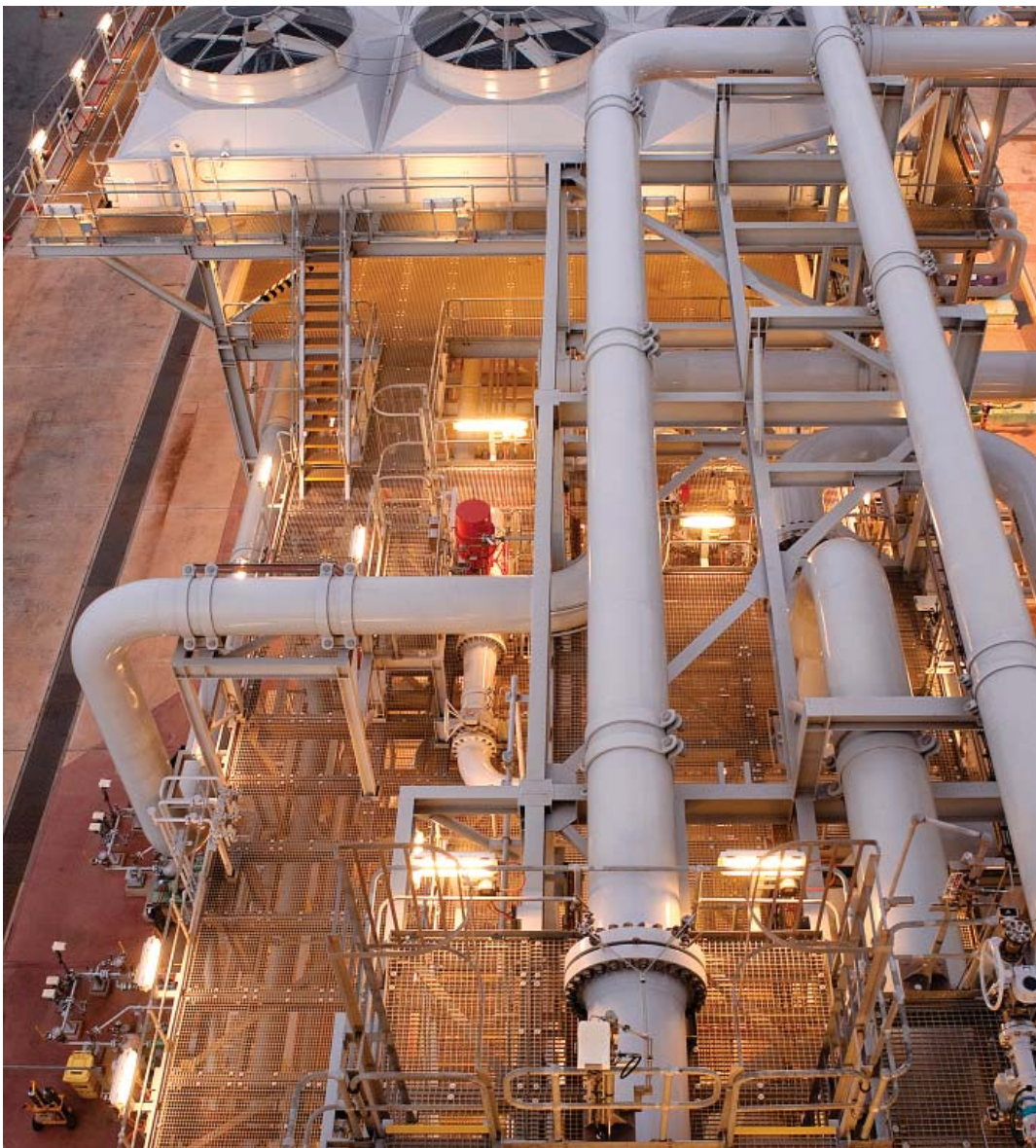
**Surveying Company:** Large Competitor

**Scope:** Mechanical erection of preassembled modules, plant & equipment, piping & structural works for LNG train & gas turbine generators. Install interconnecting structural steel and pipe-work for the LNG train at Pluto

**Duration Period:** approx. 32 months

**Contract Value:** **Approx. \$230 million**

**No. of Surveyors required to complete scope at peak:** **10 onsite**



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## Summary

Although these scopes were not identical it is clear that substantially less resources were required to complete scope 1 compared to scope 2. However the intention of this comparison was to show that there can be greatly varying differences in productivity levels between surveying teams completing similar scopes of work.

If you compare both scopes of work in regards to the ratio of overall contract value to No. of surveyors. Xcel Surveying would require 5-6 surveyors at peak versus 10 surveyor at peak to perform the scope of work 2. This difference would impact the overall cost substantially.

In addition to completing scope of work 1 (Offsite and Utilities), Xcel Surveying were engaged to complete the final stages of scope of work 2 (LNG Trains) due to resource issues with the surveying team provided by our competitor.

We were provided with a client testimonial for the work we did on the LNG trains:

Testimonial from Senior Project Engineer (LNG Trains)

*“XCEL were very professional and reliable, regular updates were provided from the surveyors on their work fronts. The team was very approachable and always managed problems with a positive frame of mind. XCEL were the 3rd surveying contract utilised by us on the Pluto project and the most professional. I would absolutely consider XCEL for future contracts and have no hesitation in recommending XCEL’s services.”*



Xcel Surveying provides specialist surveying and spatial solutions services Australia wide on major Urban, Resource and Oil & Gas infrastructure projects. Our team of spatial professionals consists of certified engineering & licenced surveyors that have dedicated their careers to working on the most technical and challenging major projects worldwide. Combining our expert team with the latest and most advanced technology enables us to provide spatial solutions of the highest accuracy and efficiency to our clients.