

Precast concrete tank

Installation Guide

Introduction

This manual gives guidance on how to install a Marshalls Civils and Drainage Precast Concrete Tank of the following type

Type: Flat Pack
System: Bolted panels

Drawings

Drawings will be referenced and issued under cover of a Marshalls Civils and Drainage 'Drawing Issue Sheet'. Only construction issue drawings should be used.

Health and Safety

A Risk Assessment for 'Handling of Non standard Products' is also included. See Appendix B. Marshalls Civils and Drainage is committed that its products are designed and manufactured to ensure the safety of users. Installation of products involves breaking ground and is thus considered as construction work under the Construction (Design and Management) Regulations 2015.

In-situ Concrete Specification

To be in accordance with 'Civil Engineering Specification for the Water Industry'

Lifting and Handling

All components supplied will utilize a threaded lifting socket system. The system allows both unloading from lorries and to 'tilt' into position during erection. Wall panels will also have threaded sockets for erection purposes and are used to plumb the wall panels.

Assembly Sequence Summary

The following is the recommended assembly and casting sequence

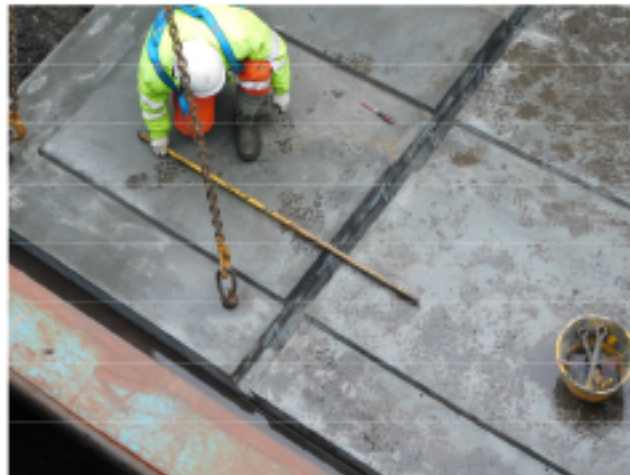
1. Lay granular foundation or blinding as required by scheme design
2. Place precast base slab if being supplied or cast in-situ slab
3. Position and plumb the shorter end panels
4. Position long side panels and bolt to end panels
5. Insert internal panels
6. Grout under walls / vertical joints
7. Grout in dowels to top wall panels if detailed
8. Place cover slab and grout in dowels if detailed.

Assembly and Construction Details

Generally a 150-200mm well compacted granular foundation is suitable. The depth will depend on ground conditions i.e. in poor ground a deeper foundation will be required.

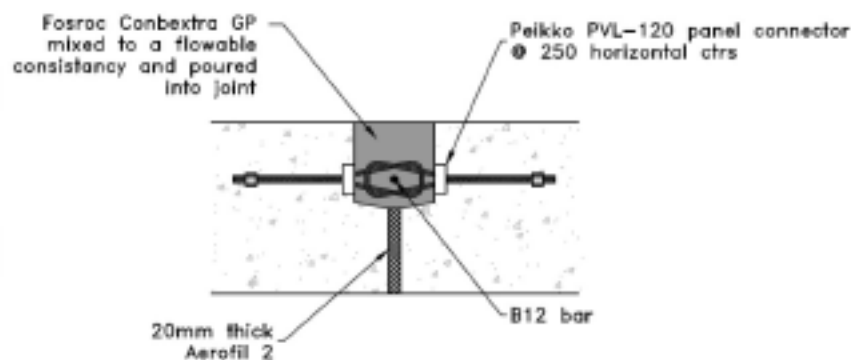
If a precast base slab is being supplied, it is important it sits level and is bedded evenly on the foundation stone. It is generally advisable to use a 15-20mm final leveling screed. This should be a sharp sand / cement mix.

Place the base slab and check for level.



Levelling the base slab

Some pre-cast base slabs may be supplied segmental. A peiko joint is provided to stitch the panels together after installation.



Peiko joint



Peiko half joint



Peiko loop pulled out prior

If a screed or internal slab is required, the Peiko joint can be infilled in with the screed.

The wall panels are placed on leveling shims set to level. The shims should be plastic 70mm square.



Walls shims prior to placing wall panel

Push pull props can be used to plumb the wall panels utilizing the cast in sockets for the prop brackets. The prop brackets can be drilled into the base slab if 'Kelly Blocks' are not being used.

The inserts are set to accommodate Leada Acrow push pull prop system

Push-Pull Props

The Leada adjustable push-Pull prop has been adapted in principle from the Leada Acrow prop. It includes the standard prop collar with an additional locking device to maintain rigidity and maximum safety.



Push-Pull Prop Head Plate

The head plate is attached to the push-Pull prop inner by means of a rivet head pin and spring clip and is provided with 2 x 22mm diameter holes at 100mm centres for final fixings.



Push-Pull Prop Base Plates

The base plate is attached to the push-Pull prop outer by means of a spring clip and extended rivet head pin. An attachment of 4 x 18mm and 2 x 22mm holes provided for final fixings.



	Size	Min Centre Pivots	Max Centre Pivots	
55103	0	990mm	1780mm	10.90
55104	1	1700mm	3070mm	19.30
55105	2	1930mm	3300mm	20.20
55106	3	2540mm	3910mm	22.80
55107	4	3150mm	4830mm	27.50
55113	Push-Pull Prop Head Plate			2.80
55114	Push-Pull Prop Base Plate			2.80



Push pull props to plumb the walls

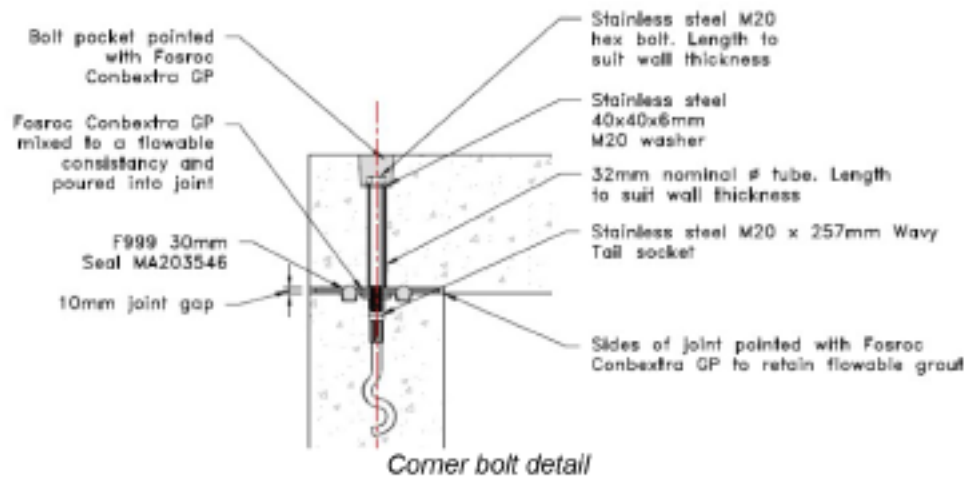
If an alternative system is required by the customer it should be specified as the cast in sockets can be set to suit.

The longer side wall panels can now be positioned. They are also set on leveling shims so the correct level can be achieved. If the bolts are placed through the holes it will allow correct alignment.

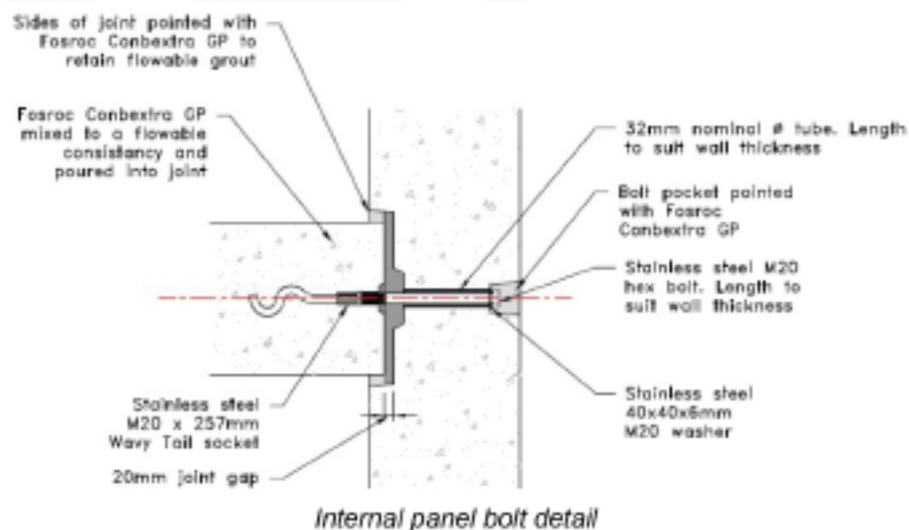
The panels can now be bolted together. Depending on the weight of the panels, it may be beneficial to just take the strain of the weight using the lifting plant. This will allow the panels to slide over the shims when being joined. Smaller panels should be Ok to be pulled together using the bolts as the panel can slide over the plastic shims.

Likewise can be done with the internal panels however the shims may require adjusting to align the bolts with the sockets.

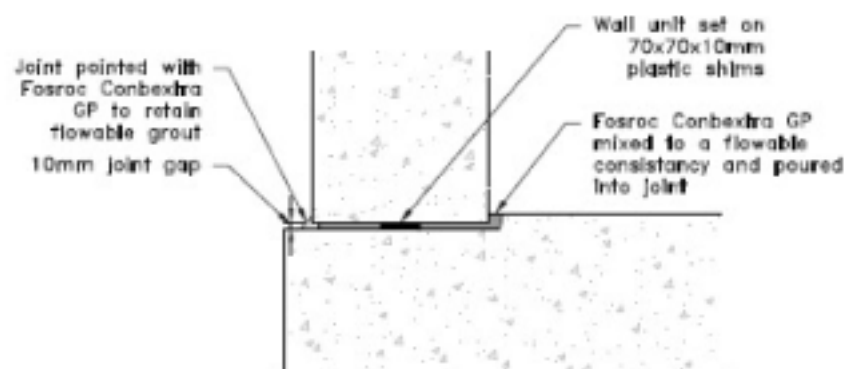
The bolts should be tightened up evenly both sides so the panels are pulled together square. Also the bolts should be tightened sequentially and partially tightened each time.



Installing Internal panel



When all four sides are bolted up, all the panels have to be flooded with grout to the underside. Gout or mortar can be placed around the outside of the panels to prevent grout loss. A general high strength grout should be used, but Marshalls Civils and Drainage recommend Fosroc 'Conbextra GP' (see details in Appendix A).



Detail to underside wall panels

The vertical wall joint can now be grouted. This can be a slow but necessary process. Once the grout is filled to the top of the wall, time should be given as it may settle and require topping up

Any internal screed etc can now be cast and plant installed prior to placing the cover slab.

The cover slab is installed on a 10mm class 1 mortar bed.

APPENDIX A – FOSROC CONBEXTRA GROUT

Fosroc® Conbextra GP



constructive solutions

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CI/SB: Yq4
June 2018

High-flow, non-shrink, cementitious grout conforming to the requirements of BS EN 1504-3 Class R4 and BS EN 1504-6: Anchoring of reinforcing steel bar.

Uses

Conbextra GP is used for free flow, non-shrink, cementitious grouting of gap thicknesses 10 to 75 mm. Recommended applications include:

- Stanchion baseplates
- Joints between pre-cast concrete panels
- Grouting applications where pouring access is restricted
- Anchoring of reinforcing steel bars
- Installation of tie bars
- Trowelling consistency can be used for bedding and in lieu of dry packs

Advantages

- Non-shrink
- High strength
- Chloride free
- Can be used at flowable or trowelable consistency
- Conbextra GP complies with LU Standard 1-085 'Fire Safety Performance of Materials'.

Description

Conbextra GP is supplied as a ready to use dry powder. The addition of a controlled amount of clean water produces a free-flowing grout for gap thicknesses up to 75mm. The low water requirement ensures high early strength and long-term durability.

Conbextra GP is a blend of Portland cements, graded fillers and chemical additives. The filler grading produces a highly flowable grout which will not segregate or bleed.

Specification clause

The grout shall be Conbextra GP a pre bagged single component cementitious material which conforms with the requirements of BS EN 1504-3 class R4 and BS EN 1504-6.

It shall be mixed with clean water to the required consistency and not exhibit bleed or segregation

A volumetric expansion of up to 1% shall occur while the grout is in a plastic state by means of a gaseous system.

The compressive strength of the grout shall exceed 40 MPa at 7 days and 60 MPa at 28 days.

The storage, handling and placement of the grout must be in strict accordance with the manufacturer's instructions.

Standards compliance

Conbextra GP complies with classification R4 according to BS EN 1504-3.

Conbextra GP complies with the requirements of BS EN 1504-6 : Anchoring of reinforced steel bar.

 0370	
Fosroc Ltd Drayton Manor Business Park, Coleshill Road, Tamworth, B78 3TL, UK 09 DoP: UK9-09 0370-CPR-0845	
Conbextra GP	
EN1504-3: Structural and non-structural repair methods 3 and 4 EN 1504-6: Anchoring of reinforcing steel bar	
Compressive strength	Class R4 (≥ 45 MPa)
Adhesion strength by pull-off test	≥ 2.0 MPa
Chloride ion content	$\leq 0.05\%$
Thermal compatibility: freeze thaw cycling with immersion	≥ 2.0 MPa
Carbonation resistance	Passes
Elastic modulus	22 GPa
Testing of anchoring products by the pull-out method	≤ 0.6 mm at 75 kN load
Fire classification	Class A1
Dangerous substances	Complies with 5.3 (EN1504-6) 5.3 (EN1504-3)

Fosroc® Conbextra GP

Properties

The following results were obtained at a water : powder ratio of 0.18 and a temperature of 20°C unless otherwise stated.

Test method	Standard	EN 1504 requirement	Result
Compressive Strength	EN 12190:1999	Class R4 $\geq$ 45 MPa	@ 1 Day 15 MPa @ 7 Day 45 MPa @ 28 Days 65MPa
Bond strength by pull off:	EN 1542:1999	Class R4 $\geq$ 2.0 MPa	2.6 MPa
Chloride ion content:	EN 1015-17:2000	Class R4 $\leq$ 0.05 %	0.02%
Freeze thaw cycling:	EN 13687-1:2002	Class R4 $\geq$ 2.0 MPa	2.3 MPa
Resistance to carbonation d	EN 13295:2005	Class R4 $\leq$ ref concrete	Conforms
Elastic Modulus in Compression	EN 13412	Class R4 $\geq$ 20 GPa	22.1 GPa @ 28 days
Testing of anchoring products by pull out method	EN 1881	@ 75 KN load $\leq$ 0.6 mm	0.49 mm Dry Test 0.44 mm Wet Test
Fire rating	EN 1504-3 cl.5.5	-	Class A1 Non-Combustible
Flexural strength	BS 6319 Pt 3:1990	-	10.0 MPa @ 28 days
Setting time	BS 4551 Pt14:1980	-	Initial set: 6 hours
Fresh wet density	-	-	Nominally 2080 kg/m ³
Alkali reactive particles	Method TI-B 52	-	$\geq$ 1.0 vol %
Time for expansion	-	-	Start : 15 minutes Finish : 2 hours
Grout consistency / Water addition	-	-	Flowable: 4.0 - 4.5 litres water / 25kg bag Trowellable: 3.4 - 3.6 itres water / 25kg bag
Minimum thickness	-	-	10mm
Maximum thickness	-	-	75mm

Clarification of property values: The typical properties given above are derived from laboratory testing. Results derived from field applied samples may vary.



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Application instructions

Preparation

Foundation surface

The substrate surface must be free from oil, grease or any loosely adherent material. If the concrete surface is defective or has laitance, it must be cut back / scabbled to a sound base. Bolt holes or fixing pockets must be blown clean of any dirt or debris.

Pre-soaking

For a minimum of 2 hours prior to grouting, the area of cleaned foundation should be flooded with fresh water. Immediately before grouting takes place, any free water should be removed. Particular care should be taken to blow out all bolt holes and pockets. Where water soaking is impossible contact Fosroc Technical Service.

Base plate

It is essential that this is clean and free from oil, grease or scale. Air pressure relief holes should be provided to allow venting of any isolated high spots.

Levelling shims

If these are to be removed after the grout has hardened, they should be treated with a thin layer of grease.

Formwork

The formwork should be constructed to be leakproof as Conbextra GP is a free-flowing grout. This can be achieved by using foam rubber strip or Silicone Sealant 33HM beneath the constructed formwork and between joints.

In some cases it is practical to use a sacrificial semi-dry sand and cement formwork. The formwork should include outlets for the pre-soaking water.

The unrestrained surface area of the grout must be kept to a minimum. Generally the gap width between the perimeter formwork and the plate edge should not exceed 150 mm on the pouring side and 50 mm on the opposite side. There should be no gap at the flank sides.

Mixing

Water addition: Flowable: 4.0 - 4.5 litres per 25Kg bag
Trowelable: 3.4 - 3.6 litres per 25Kg bag

For mixing quantities up to 50 kg a Bosch (or equivalent) 1150 watt, 280 to 640 rpm, 110 volt drill, fitted with a Conbextra Mixing Paddle (MR3) is suitable.

For best results a mechanically powered grout mixer should be used. Larger quantities will require a high shear vane mixer. Do not use a colloidal impeller mixer.

It is essential that machine mixing capacity and labour availability is adequate to enable the grouting operation to be carried out continuously. This may require the use of a holding tank with provision for gentle agitation to maintain fluidity.

Prior to the first mix the vessel should be wetted and drained. The selected water content should be accurately measured into the mixer. Slowly add the total contents of the Conbextra GP bag, mix continuously for 5 minutes, ensuring a smooth, even consistency is obtained.

Placing

Place the grout within 20 minutes of mixing to gain the full benefit of the expansion process.

Conbextra GP can be placed in thicknesses up to 75 mm in a single pour.

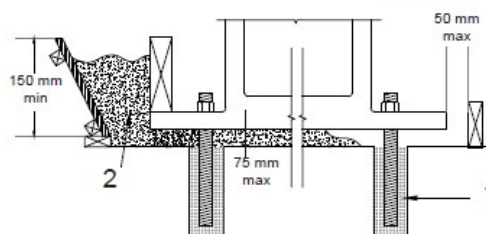
For thicker sections use Conbextra TS grout.

Any bolt pockets must be grouted prior to grouting between the substrate and the base plate.

Continuous grout flow is essential.

Example of a typical hopper system:

Removable hopper: For larger pours the grout may be hand placed or pumped into a removable hopper (trough)



- 1 Conbextra GP or Lokfix* (first stage))
- 2 Conbextra GP poured or pumped into removable hopper (second stage)

* Also available from Fosroc.*

Sufficient grout must be available prior to starting and the time taken to pour a batch must be regulated to the time taken to prepare the next one.



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The mixed grout should be poured only from one side of the void to eliminate the entrapment of air or surplus pre-soaking water. This is best achieved by pouring the grout across the shortest distance of travel. The grout head must be maintained at all times so that a continuous grout front is achieved.

Where large volumes have to be placed Conbextra GP may be pumped. Screw feed and piston pumps are suitable for this purpose.

When the Conbextra GP has reached trowellable consistency, the unrestrained portion should be cut back to the baseplate/ bearing plate.

Curing

On completion of the grouting operation, exposed areas should be thoroughly cured with Concure WB curing membrane, continuous application of water and/or wet hessian.

Anchoring applications

Holes should be drilled with a rotary percussive air flush drill and deformed bars should be used. Diamond cored holes should be roughened or under-reamed. The holes should be prewetted for a minimum of 2 hours prior to grouting. Remove water before grouting.

The mixed grout should be poured into the hole and the bar pushed through the grout.

Cleaning

Conbextra GP should be removed from tools and equipment with clean water immediately after use. Cured material can be removed mechanically, or with Fosroc Acid Etch.

Estimating

Supply

Conbextra GP is supplied in 25 kg bags.

Yield

Allowance should be made for wastage when estimating quantities required. The approximate yield per 25 kg bag for different consistencies is:

Consistency	Trowellable	Flowable
Yield:	12 litres	13.25 litres

Limitations

Low temperature working

When the air or contact surface temperatures are 5°C or below on a falling thermometer, warm water (30°C to 40°C) is recommended to accelerate strength development. Substrates should be free from ice.

For ambient temperatures below 10°C the grout consistency should be flowable and the formwork should be maintained in place for at least 36 hours.

Normal precautions for winter working with cementitious materials should then be adopted, specifically protecting the grout from freezing in the first 48 hours after placing.

High temperature working

At ambient temperatures above 35°C the mixed grout should be stored in the shade. Cool water (below 20°C) should be used for mixing the grout.

Storage

Store unopened bags in cool dry internal conditions. Conbextra GP has a shelf life of 12 months if kept in a dry store in sealed bags. If stored in high temperature and high humidity locations the shelf life may be reduced to less than 6 months. Conbextra GP is not supplied in waterproof packaging; individually or palletised.

Precautions

Health and safety

For further information refer to appropriate Product Safety Data Sheet available at www.fosroc.com

Fire

Conbextra GP is non-flammable.

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Important note

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APPENDIX B - RISK ASSESSMENT

Ref: Standard product Lifting statement Marshalls Civils and Drainage	Risk Assessment Leading to Method Statement	
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General Information

Job description: Handling of 'Non-Standard' Products on customer sites	Date: 10.02.12
Location: Marshalls Civils and Drainage	
Person carrying out assessment: Ian Kenning H,S&E Manager,	Review Date: 10.12.13 (or before if required)

Risk Assessment (Safety)

Severity	Fatality	Medium	High	High	Very High	Very High
	Major Injury	Medium	Medium	High	High	Very High
	Reportable Injury	Low	Medium	Medium	High	High
	Lost Time Injury	Low	Low	Medium	High	High
	Minor Injury	Low	Low	Low	Medium	High
Marshalls Civils and Drainage Matrix (Guide)		Improbable	Remote	Possible	Probable	Likely
Probability						

Hazard	Person (s) at risk	Risk Level	Control Measures	Residual Risk
Crane lifting operations: Overload of Static Crane/ Lorry Crane	Crane operator, Site Operatives Slingers, Banks man Lift Supervisor	High	Crane lifting capacity to be identified on the crane and certification available in cab. • Lift Plan required, Including:- • Weights of loads to be established • Ground conditions confirmed • Radius of lift to be ascertained for load • Operator competency checks • Slinger / banks man competency checks • Operator / user instructions available in cab	Providing all the existing control measures are in place, the residual risk will be LOW.
Overloading of Lifting Accessories (Chains, Hooks, Deha Anchors, web slings etc)	Crane operator Site Operatives Slingers, Banks man Lift Supervisor	High	Lifting accessories SWL requirements to be confirmed • Lifting accessories to be attached and used as intended. • Lifting chain angles to be correct • Pre use inspection to be undertaken by competent person before use. • Operator / User instructions to be briefed by a competent person to all those involved in the lifting operation. • Operators to be trained and competent in the use of lifting accessories provided. • Current certification to be made available.	Providing all the existing control measures are in place, the residual risk will be LOW.

Slip, Loss of Load , Crush / Trap Collapse, Collision, Contact with overhead cables	Crane operator Site Operatives Slingers, Banks man Lift Supervisor	High	- Competent experienced and trained singer(s) to be used for all lifting operations. - Manufacturers or suppliers lifting points To be used a all times. - Site Assessment to be made clear by Contractor, Lift Planner.	Providing all the existing control measures are in place, the residual risk will be LOW.
Overturning of Static Crane / Lorry Crane	Crane Operator Site Operatives Slinger Banks man Lift Supervisor	High	Crane lifting capacity to be established - Weights of loads to be established - Ground conditions to be confirmed by site - Radius of lift to be ascertained for load - Operator competency checks to be made - Slinger / Banksman competency to be checked - Refer to load chart for lifting capacity of crane. - Access and egress to lifting area must be suitable for equipment being used. - Areas of soft ground shall be avoided	Providing all the existing control measures are in place, the residual risk will be LOW.
Weather conditions	Crane operator, Site operatives Slinger Banks man Lift Supervisor	Medium	- Lifting operations will cease when ground conditions deteriorate following heavy rain, snow, ice etc. - Lifting operations will cease when wind speeds exceed the manufacturers stated limit for the Static /Lorry crane. - Lifting operations must cease during thunder storms	Providing all the existing control measures are in place, the residual risk will be LOW.
Working at Height. Falls	Crane operator Lorry Crane Slinger, Banks man	High	- Rail Side 'Fall Protection System' Where available. - If working from a ladder, three points of contact must be maintained. and footed, use under short duration. (This may not be allowed on some customer sites)	Providing all the existing control measures are in place, the residual risk will be LOW.