

Procedure for the Quality Control of the manufacture of hydraulic and mechanical equipment and steelwork

Document reference: QC-GEN-001

Prepared by: TEB

Dorman Long Technology

The Charles Parker Building Midland Road, Higham Ferrers Northamptonshire NN10 8DN United Kingdom

Tel +44 (0)1933 319133 Fax +44 (0)1933 319135

dlt@dormanlong.com

http://www.dormanlongtechnology.com

Issue and Amendment Record

Revision:	Date :	Status:	Comments :
l1	14 th June 2013	Information	First Issue
12	30 th July 2014	Information	Appendices updated

QC-GEN-001 I2 1 of 14



Document Ref : QC/GEN/001

Contents

SECTION		TITLE
1.0 2.0 3.0		AIM OF DOCUMENT ROLES PROCESS FLOW
3.1	3.1.4 3.1.5 3.1.6 3.1.7	Inputs Project Quality Plan and Project Equipment Schedule Manufacturing Drawings Material Lists General Arrangement Schematic Drawings and Part Lists
3.2	3.2.1	Manufacturing Process Control of material sourcing & bought-in items Welding Process Controls Control, inspection and verification of Workmanship Non Conformance Reports Resolving Technical Queries Progress Monitoring Output Verification Manufacturing Documentation Review
Appendix 1	1	Project Quality Plan and Project Equipment Schedule Example
Appendix 2	2	Manufacturing Programme Example
Appendix 3	3	Standard ITPs
Appendix 4	1	Project As-built Quality File
Appendix 5	5	List of standard Equipment Testing Method Statements

QC-GEN-001 I2 2 of 14



1.0 AIM OF DOCUMENT

This document summarises the Quality Assurance and Quality Control system used by Dorman Long Technology for the supply of hydraulic and mechanical equipment and steelwork.

2.0 ROLES

DLT uses approved sub-contractors to undertake the manufacture of hydraulic and mechanical equipment and the fabrication of steelwork, using drawings, specifications and other information provided by ourselves.

DLT undertake the design of the equipment using their in-house engineering resources. The design is undertaken in accordance with a written Project Design Statement and/or Project Equipment Schedule. These two documents define the design inputs, design standards, design constraints and performance requirements for the project. Customers are sometimes asked to review and agree these documents.

Sub-contractors are selected and approved in accordance with our ISO9001 approved company management system. This approval is subject to periodic review and sub-contractors who have failed to perform may be removed from the list.

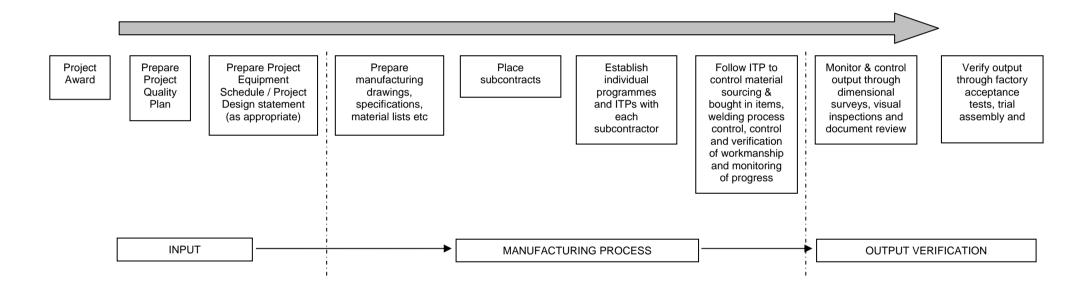
DLT Quality Control team will inspect and monitor the progress of the manufacture and fabrication at the subcontractor's workshop in accordance with the appropriate Inspection and Test Plan (ITP). This is in addition to any quality control system which our sub-contractor is operating.

The Management ensure that an audit of the inspection and monitoring is undertaken by the DLT Quality Control team at least once per year to verify that they are following the appropriate ITP.

QC-GEN-001 I2 3 of 14

3.0 PROCESS FLOW

The following section defines the process flow used for managing the quality of the manufacture and factory testing of hydraulic and mechanical equipment and steelwork. The process flow consists of:-



QC-GEN-001 I2 4 of 14



3.1 INPUTS

The following define the inputs into the manufacturing process. All relevant elements should be in place before the manufacturing process can commence.

3.1.1 Project Quality Plan and Project Equipment Schedule

DLT will produce a Project Quality Plan. This document records the particulars of the project and defines the responsibilities, scope, key programme dates etc. A Project Equipment Schedule is produced that defines the type and quantity of equipment to be manufactured; the performance and design criteria for the equipment; the approval and certification required including the requirements for the ITP; the factory acceptance testing; external approval requirements and final documentation required. Refer to Appendix 1 for examples of a Project Quality Plan and Project Equipment Schedule.

3.1.2 Manufacturing Drawings

If appropriate, DLT will produce and issue manufacturing drawings to the Sub-contractor. Only drawings labelled "For Construction" and with a revision "C1" or above will be used for manufacture. The Sub-contractor may choose to create his own working sketches and drawings from the DLT issued Construction status drawings, but all In-process checking, Output checking and verification will be done with reference to the DLT construction issue drawings.

3.1.3 Material Lists

If appropriate, DLT will produce and issue material lists to the Sub-contractor. These may be either as tables included on the Construction status manufacturing drawings, or as a separate table. Only drawings or tables marked "For Construction" shall be used to order materials. The Sub-contractor may choose to create his own material list, but all In-process checking, Output checking and verification will be done with reference to the DLT construction issue material lists.

3.1.4 General Arrangement Schematic Drawings and Part Lists

If appropriate, DLT will produce and issue, or approve, general arrangement and schematic drawings with associated part lists. This is often the case for hydraulic or electrical circuits. Only drawings labelled "For Construction" and with a revision "C1" or above will be used for manufacture.

3.1.5 Specifications

If appropriate, DLT will produce and issue a specification. This can be in the form of a series of Notes drawings, or in the form of a written document. The specification may refer to National Standards or Norms or Codes of Practice. Only specifications marked "For Construction" shall be used.

3.1.6 Document Control

All documents, drawings and specifications issued to the Sub-contractor will be recorded in a single register – which will record document reference, document title, revision version, date of issue and to whom the document has been issued. The register will be organised in a logical manner so that it is easy to quickly determine the current revision version of each document. An updated copy of the register will be sent with every issue of documents.

3.1.7 Commercial Agreement

DLT will enter into a formal written commercial agreement with the sub-contractor for the manufacture of equipment or steelwork. Such a commercial agreement may be in the form of a purchase order or formal contract. If the agreement is in the form of a purchase order, it will be issued using the standard company purchase order pro-forma which goes through a series of 'electronic' signatures prior to being issued. If the agreement is in the form of a formal contract, the contract should be signed and dated by an Authorised Signatory of the Company. The contract or purchase order will state the following items of information:-

QC-GEN-001 I2 5 of 14



- Date of Issue
- · Scope of Work
- Price
- Delivery Date(s)

3.1.8 Project Planning

Immediately on award of the contract or purchase order, the sub-contractor will produce a detailed manufacturing programme detailing each activity, its duration and its relationship with other activities in sufficient detail to demonstrate they have a clear understanding of the project.

This detailed manufacturing programme shall be reviewed by DLT. Any comments will be discussed with the Sub-contractor and the programme revised until both parties are satisfied. This final version of the programme will be used to monitor the manufacturing progress. Refer to Appendix 2 for an example manufacturing programme.

QC-GEN-001 I2 6 of 14



3.2 MANUFACTURING PROCESS

This section outlines the activities undertaken by DLT to control quality during the Manufacturing Process of the equipment. For each item being manufactured a specific inspection and test plan (ITP) will be followed. Generally these are standard plans which have been developed in-house. However if necessary a project specific ITP will be produced and used.

The individual Inspection and Test Plans (ITP) identify a number of hold points. These might include material order, material delivery, material testing, welding process controls, workmanship check and dimension checks. Examples of standard ITPs are contained in Appendix 2.

3.2.1 Control of material sourcing & bought-in items

Where appropriate DLT will specify to the subcontractor which material supplier or suppliers they must use to source material. This can include specifying which steel mill the steel plate or forge ingot must be purchased. Where appropriate DLT will also undertake independent sampling and material tests of incoming material to verify the chemical and mechanical properties comply with the requirements of the specification and drawings.

The subcontractor will be required to provide a list of the Suppliers for the bought-in items to enable DLT to undertake checks to determine if the supplied items are genuine.

3.2.2 Welding Process Controls

All structural welding will be carried out in accordance with written welding procedure specifications which are appropriate for the material type and thickness, filler type, joint type and welding method and position. All welding procedures will have been subject to a qualification test to demonstrate that the welded joint has the properties that satisfy the design requirements. Where required the qualification of a welding procedure may be witnessed by an independent certifying body.

DLT Quality inspectors ensure that the Sub-contractor's welding staff have been qualified on all weld procedure they are undertaking.

Welds are subject to non-destructive examination (NDE) using appropriate methods in accordance with the requirements of the specification. This NDE may be carried out by the Sub-contractor's own inspectors, with DLT witness, or by an independent NDE inspector as defined in the ITP and other project documents.

3.2.3 Control, inspection and verification of Workmanship

Throughout the manufacturing process the sub-contractor's workmanship will be subject to inspection by DLT's Workshop based inspectors with the aim of ensuring the finished item of equipment or fabrication meets the requirements of drawings and specification. Such inspections will include checks of material and parts on arrival at the sub-contractor, dimensional checks, visual inspections, reviews of any NDT inspection records, surface finish checks and corrosion protection system checks. These inspections will be undertaken in accordance with the requirements of the ITP.

DLT will also review the calibration records of all measuring instrumentation used by the Subcontractor to ensure the instrument's calibration has been checked within the period recommended by the instrument's supplier.

3.2.4 Non Conformance Reports

A Non-conformance report (NCR) will be raised for any aspect of the manufacture which does not comply with the construction issue documents (eg material lists, specification and drawings). This NCR will be submitted by DLT workshop based inspector to the sub-contractor, who will be expected to respond within 24 hours with a proposal to correct the non-conformance. If no response if received

QC-GEN-001 I2 7 of 14



in 24 hours, the issue will be escalated by DLT inspector to the hierarchy of DLT Quality Manager and further to the DLT General Manager if required.

A register of NCR will be maintained which records the unique NCR numbers, a brief description of NCR, date issued, date of Sub-contractor's response, date agreed to correct non-conformance and date this correction was verified and accepted by DLT.

3.2.5 Resolving Technical Queries

DLT will operate a Technical Query (TQ) system with the Sub-contractor. Should the sub-contractor have any technical questions relating to the drawings, specifications, material lists etc, he will raise a TQ. This will detail the technical question, and should be submitted to DLT using a standard proforma.

DLT will consider the technical query and act accordingly. They will respond to the Sub-contractor using the pro-forma, and if necessary revise and reissue any necessary documents.

A register of TQs will be maintained which records the unique TQ number, a brief description of TQ, date of receipt from Sub-contractor's, expected response date, and noted as 'Closed' once the technical query has been resolved.

3.2.6 Progress Monitoring

DLT will monitor the progress of the manufacture at regular intervals against the agreed detailed manufacturing programme. Activities that are running late will be identified. DLT will assess the impact of each late running activity. For activities on, or at risk of being on, the Critical Path the subcontractor will be asked to propose actions to accelerate progress. After agreement by DLT, these proposals will be implemented by the sub-contractor and monitored by DLT. A sample of monitored manufacturing programme is attached in Appendix 2.

QC-GEN-001 I2 8 of 14



3.3 OUTPUT VERIFICATION

The output (the completed item of equipment or item of steelwork) will be verified following the method identified in the Inspection and Test Plan (ITP). This might include:-

3.3.1 Manufacturing Documentation Review

A formal review of the manufacturing records and documentation will be undertaken and an as-built records file compiled into a Project As-built Quality File (refer to Appendix 4).

3.3.2 Dimension Survey and visual inspection

A dimension survey of the completed equipment or steelwork will be undertaken to verify all key dimension. Key dimension are considered to be those which effect interfaces.

A systematic visual inspection of the completed equipment or steelwork will be undertaken. This will include consideration of the corrosion protection.

3.3.3 Factory Acceptance Tests and Trial Assembly

Equipment will be subjected to factory acceptance tests (FAT) as defined in the project equipment schedule in accordance with standard or project specific testing procedures. FAT can include the pressure, load and function testing of equipment. A list of standard DLT FATs is included in Appendix 5.

Trial assembly may be carried out. This might be a partial or full trial assembly depending on the nature of the steelwork being fabricated and the project requirements. For anything but the simplest partial trial assembly, the sub-contractor and DLT will work together to produce a method statement for the trial assembly which identifies the scope of assembly, the checks to be made.

The results of the factory acceptance tests and trial assembly are presented in the form of a certificate of testing and examination using the appropriate pro-forma. Copies of these certificates are provided to the Customer with the equipment.

3.3.4 Non-conformances

The sub-contractor will be informed of non-conformances arising from the output checking and verification, and an action plan agreed to correct them.

QC-GEN-001 I2 9 of 14



Appendix 1 – Project Quality Plan and Project Equipment Schedule Example

QC-GEN-001 I2 10 of 14



PROJECT No: D2338

PROJECT: Riyadh Metro Line 4 - DL-SE500/36

Gantry & DL-TLC500 Transporter

Ref: D2338/QP

Page 1 of 7

Rev: 00

Date: 3 April 2014

CONTENTS

PROJECT HANDOVER DOCUMENTS

- 1. CONTRACT PARTICULARS
- 2. ORGANISATION AND RESPONSIBILITIES
- 3. SCOPE OF WORK
- 4. PERFORMANCE, DESIGN AND MANUFACTURING CRITERIA
- 5. DELIVERABLES
- 6. PROGRAMME
- 7. SELECTION / MONITORING / INSPECTION OF SUB-CONTRACTORS
- 8. REVIEW/VERIFICATION/VALIDATION
- 9. DOCUMENT MANAGEMENT
- 10. APPROVALS AND CERTIFICATION

APPENDICES

Preliminary Programme

	ORIGINATOR	APPROVED
NAME:	David Dyer	Tom Betts
POSITION:	Managing Director	Project Director
SIGNATURE:		
DATE:	3 April 2014	3 April 2014



PROJECT No: D2338

PROJECT: Riyadh Metro Line 4 – DL-SE500/36 Gantry & DL-TLC500 Transporter

Ref: D2338/QP

Page 2 of 7

Rev : 00

Date : 3 April 2014

To be appended to this form and brought to the Handover Meeting or located and referenced if more appropriate		Appended	Location and reference / Other Comments
		Y/N	Location and reference / Other Comments
Letter of appointment / PO / Contr	act	N	Saved in project folder
Tender letter		N	Contract based on offer letter M0483/HF/01/Q002 dated 6 th March – although not referred in contract
Pricing spreadsheet inc Risk Asse	ssment Form F002/4	N	M0483 Final contract price.xls
Tender Document Register		N/A	
Client's Tender Documents		N	
Tender Amendments		N	
RFIs		N	
Other Correspondence		N	
Tender Design		N	Drawing M0481-001,011to014, 021, 032, 032, 047 042, 051, 052 , SK-001
Contract Review			
Have there been any amendments to thwas approved and submitted?	e tender terms since it	Y/N	Comments
Client brief			
Scope of work		Y	Clarification over responsibility for load testing outside KSA
Conditions of engagement		Υ	Reviewed and accepted
Payment terms		Y	Reviewed and accepted
Programme		N	
Other (Describe in comments)		N	
Significant Project Details			
To be established / confirmed at Hando	ver Meeting	Comments	
Budget / Fixed Price	Fixed Price		
Start Date	19-03-2014		
Completion date See note		Transporter Damman	delivery 1/12/14 Gantry delivery 1/1/15 both CIF
Date of first project review	TBC		
Date of first Client meeting See note		Not defined	
Date of first submission / Delivery	10/4/14	PDS and So	cheme drgs to be submitted for Customer approval
Independent checker	N/A		
Other (Describe in comments)			

Proposal Manager	David Dyer	Date:	26 March 14
Project Manager	Tom Betts	Date:	26 March 14



PROJECT No: D2338

PROJECT: Riyadh Metro Line 4 – DL-SE500/36

Gantry & DL-TLC500 Transporter

Ref: D2338/QP

Page 3 of 7

Rev : 00

Date : 3 April 2014

1. CONTRACT PARTICULARS		
	COMPANY	REPRESENTATIVE(S)
1.1 Client Name		
Address		
1.1a Client Contact Details		
1.2 Clients Order Number/ Confirmation Reference	Contract headed "Purchase ORDER (LUMP S AND TRANSPORTER SET IPurchase Order No] and	IT LIMITED age 3
1.3 Charge Basis Payment Basis	Lump Sum	
1.4 Other Parties to Contract	None	
Payment Basis	Lump Sum	Dilent 2014-05-19

2. ORGANISATION AND RESPONSIBILITIES		
2.1 Project Manager:	Tom Betts	
2.2 Key Project Team Members	Design Leader and Engineering manager - David Taylor Mechanical project engineer – Dave Kirkham	
	Production Manager – Huang Qingfeng	
	Control system lead engineer – Gavin Yang	
	Quality Manager – Zhang Zhi	



PROJECT No: D2338

PROJECT: Riyadh Metro Line 4 – DL-SE500/36

Gantry & DL-TLC500 Transporter

Ref: D2338/QP

Page 4 of 7

Rev : 00

Date : 3 April 2014

2.3 External Suppliers	TLC500 manufacturer – Tolian Gantry fabrication – Tolian Strand Jack / Hydraulic ram manufacturer – Deaki HPU manufacturer – Xinyuan Chain Drive manufacturer – Tolian Control System assembly – DLTC
2.4 Organisation Chart	-

3. SCOPE OF WORK	
3.1 Project Description	Supply of a Span erection gantry and multi wheeled transporter for use in the erection of Line 4, Riyadh Metro, KSA.
3.2 DLT Scope	Design and supply a DL-SE500/36 Span erection gantry to suit the geometry of Line 4 Riyadh metro. Able to launch and erect PC deck segements on a minimum curve radius of 1250m. Able to install 36, 32 and 28m long PC girders.
	Design and supply a multi-wheeled DL-TLC500 transporter to deliver the PC girders from the Casting yard to the back of the Gantry at the bridgehead. Transporters must be able to carry 36, 32 and 28m PC girders and travel around minimum curve radius of 100m
	Option to provide support on site during the assembly and commissioning of the Gantry.
3.3 Scope by Others	N/A
3.4 Specific Exclusions	nt

4. PERFORMANCE, DESIGN AND MANUFACTURING CRITERIA		
4.1 Code and Standards	Refer to PDS	
4.2 Specific Client Requirements	 The following testing and certification will be carried out by the Supplier prior to leaving China; Steel fabrication: Execution class 2 to European standard EN 1090. Hydraulic systems: 125% pressure test. Trial assembly and full function testing of the complete DL-SE500/36 span erector. Trial assembly and function testing of the DL-TLC500 transporter to ensure all components will fit together correctly at Tolian's works prior to shipping (extent of assembly and test to be agreed in detail between the Parties as sensible to meet 	



PROJECT No: D2338

PROJECT: Riyadh Metro Line 4 – DL-SE500/36 Gantry & DL-TLC500 Transporter

Ref: D2338/QP Page 5 of 7

Rev : 00

Date : 3 April 2014

	the delivery date)
4.3 CDM Requirements	
4.4 Applicable Legislation	 The following will be considered:- Health and Safety at Work Act (HSWA), 1974 Provision and Use of Work Equipment Regulations (PUWER), 1998 Control of Substances Hazardous to Health Regulations (COSHH), 2002 Work at Height Regulations 2005 Noise at Work Regulations 2005 Lifting Operations and Lifting Equipment Regulations 1998 Pressure Equipment Directive 97/23/EC & the Pressure Equipment Regulations 1999 Machinery Directive 2006/42/EC & the Supply of Machinery (Safety) Regulations 2008 Electrical Equipment Directive 2006/95/EC & the Electrical Equipment (Safety) Regulations 1994

5. DELIVERABLES	
5.1 Calculations	Calculations in Soft copy – Both for structure and mechanicals on DL-SE500/36 and DL-TLC500
5.2 Drawings	General Arrangement Drawings in AutoCAD format
	Detailed component (structural and mechanical) drawings in AutoCAD format
5.3 Equipment	Ref to PES
5.4 Equipment Documentation	Equipment Operation and Maintenance manual (in similar detail/scope to D2232)
	Refer to PES
	Gantry and Transporter require a SASO certificate to enable it to be imported in to KSA
5.5 Methodology	Gantry Assembly and Operation Manual (probably in the form of method drawings
5.6 Other Documents	Project Design Statement & Specification – soft copy Material Lists – soft copy



PROJECT No: D2338

PROJECT: Riyadh Metro Line 4 – DL-SE500/36

Gantry & DL-TLC500 Transporter

Ref: D2338/QP

Page 6 of 7

Rev : 00

Date : 3 April 2014

6. PROGRAMME	
6.1 Milestone Dates	1) Submission of design statement, specifications and GA drawings: 19 April 2014 3) Detailed design of DL-SE500/36 and DL-TLC500: 15 Aug 2014 4) Manufacture of DL-TLC500 transporter: 30 September 2014 5) Manufacture of DL-SE500/36 span erector: 30 October 2014 6) Trial assembly a function testing of DL-TLC500 transporter: 15 October 2014 7) Final delivery of DL-TLC500 transporter (CIF Dammam): 1 December 2014 (1st "Delivery Date") 8) Trial assembly a function testing of DL-SE500/36: 15 November 2014 9) Final delivery of DL-SE500/36 (CIF Dammam): 1 January 2015 (2nd "Delivery Date")
6.2 Project Programme	Ref to "D2338 Riyadh Overall Programme v0.0.pdf"

7. SELECTION / MONITORING / INSPECTION OF SUB-CONTRACTORS		
7.1 Sub-contractor Selection	Only Approved Sub-contractors to be invited to bid	
	Potential Sub-contractors to be visited and interviewed prior to order place – qualify bid, check capacity, discuss any concerns	
7.2 Sub-contractor monitoring	Monitoring of manufacture against DLT IPT and Agreed sub-contractor programme to be monitored in detail by DLTC staff.	
7.3 Sub-contractor Inspection	DLTC Inspection and test plan to be followed	

B. REVIEW/VERIFICATION/VALIDATION		
8.1 Internal Project Review	Every 4 weeks	
8.2 External Project Review	DLTC to DLTUK – Every 2 weeks	
	DLTUK to Client – No formal requirement	
8.3 Project Verification	Detailed Technical Check / Sample Technical Check / Technical Review / Compare to Proven Work – To suit competency of Engineer undertaking work and criticality of component	
	Use of TQ system to manage and record decisions during technical review and approval of mechanical / hydraulic and electrical systems	
8.4 Project Validation	Mechanical / hydraulic component testing (refer to FAT plan) Trial assembly and function testing prior to dispatch (refer to FAT plan) 1.25 load test (to be undertaken on site in KSA)	



PROJECT No: D2338

PROJECT: Riyadh Metro Line 4 – DL-SE500/36

Gantry & DL-TLC500 Transporter

Ref : D2338/QP
Page 7 of 7

Rev : 00

Date: 3 April 2014

8.5 Technical Query System	Formal with DLTC	
	Informal to Customer – but using uniquely referenced correspondence	

9. DOCUMENT MANAGE	MENT
9.1 Specific requirement for correspondence	No
9.2 Specific Correspondence Numbering or filing requirements	No
9.3 Specific Document / Drawing or Calculation Numbering or filing requirements	Yes – Lead Engineer to define drawing number sequence
9.4 Retension of check prints	Until trial assembly and FAT complete

10. APPROVALS AND CER	TIFICATION
10.1 Internal Approval	Drawings signed and stamped prior to issue to manufacturing sub-contractor Green Pen / Red Pen system to be used in drawing /document checking
10.2 External Approval	3 rd Party Independent Design Check Independent certify body to witness pressure and load testing of hydraulic components SASO certification (Certificate of Conformity for KSA) for Client to be invited to witness any stage of testing
10.3 Certification	 The following testing and certification will be carried out by the Supplier prior to leaving the manufacturing country; Steel fabrication: Execution class 2 to European standard EN 1090. Hydraulic systems: 125% pressure test Trial assembly and full function testing of the complete DL-SE500/36 span erector and DL- TLC500 transporter to ensure all components will fit together correctly on Supplier's manufacturing site prior to delivery to the extent required by the Purchaser and agreed in detail between the Parties as sensible to meet the delivery dates Equipment certification as listed in the Project Equipment Schedule



Project: Riyadh Metro Span Erection Gantry & Transporter

Version: 07

Update Info Hydraulic Hose Test Added, Strand qty added, 1.70, 1.71, 2.30,

3.24, 4.45, 4.46, Deva, Fabreeka and Rubber items

updates/added. Valve Settings Added

Date: 2014-07-24

The quantities below are what should be manufactured

1. Supply of the following equipment:-

TRANSPORTER

By DLTC

Transporter Spares

By DLTC

Item	Qty	Description
1.50	1	Hydraulic Filter Set
1.51	1	Hydraulic Ram Seals (1No set for each ram type)
1.52	1	Sensor Set (1No for each sensor type)
1.53	1	Hydraulic valve set (1No for each valve type)
1.54	1	Hydraulic Hose (1No of each type / length)
1.55	1	Electrical Relay (1No for each type)
1.56	1	Reducer and motor
1.57	1	Wheel bearing
1.58	4	Tyres
1.59	2	Engine Filter Set (Oil / Diesel / Air)
1.60	2	Electrical Fuse Set (Each set with 1No for each type)
1.61	1	Control Button/switches and indicator lights set (1No for each type)

By DLTUK

Item	Qty	Description	Detail	Design
			Design	Check
1.70	16	Nylube pads 95 x 60 with dia 14 counter sunk holes	DLTUK	DLTUK
		(for outrigger bridging unit) drg D2338-TOBU-SK03		
1.71	12	Fabreeka Elastomeric Pads 180 x 300 x 25 (outrigger bridging unit)	DLTUK	DLTUK
		drg D2338-TOBU-SK03		

By DLTUK - Spares

Item	Qty	Description
1.80	4	Nylube pads 95 x 60 with dia 14 counter sunk holes
		(for outrigger bridging unit) drg D2338-TOBU-SK03
1.81	3	Fabreeka Elastomeric Pads 180 x 300 x 25 (outrigger bridging unit)



GANTRY STUCTURE

Fabricated Steelwork for Gantry Structure as shown on the following general arrangement drawings –

D2338-1001 - Gantry General arrangement Isometric

D2338-1002 – Gantry General arrangement Elevation and Plan

D2338-1003 - Gantry General arrangement Section A-A

D2338-1004 - Gantry General arrangement Section B-B

D2338-1005 - Gantry General arrangement Section B-B

And manufactured in accordance with the specification on drawings-D2338-0011 D2338-0015



GANTRY MECHANICAL

Hoist Trolleys – Main Equipment

By DLTC

Item	Qty	Description	Detail	Design
			Design	Check
2.1	2	DL-S294 Strand Jack c/w grips		DLTUK
2.2	2	DL-S294 Strand Jack fixed anchors c/w grips		
2.3	2	DL-M electrical dressing & sensors sets	DLTC	DLTUK
2.4	2	DL-CY43/29-440 hydraulic cylinders (Transverse Alignment)	DLTC	DLTUK
2.5	2	DL-L50/1/300 Hydraulic Power Pack	DLTC	DLTUK
2.6	16	60te SWL twin wheel bogies	DLTC	DLTUK
2.7	4	18te SWL chain drives units complete with electric motors and planetary	DLTC	DLTUK
		gear box		
2.8	2	D48A-2 Short pitched chain x 62m (approx) (type and length TBC to match item 2.5)	DLTC	DLTUK
2.9	2	Hoist control cabinet containing Chain drive motor inverter drives and	DLTC	DLTUK
		slave PLC		
2.10	2	DL-CY43/29-240 hydraulic cylinders (Lifting Beam leveling rams)	DLTC	DLTUK
2.11	2	Strand Jack Hose set 10m (TBC)	DLTC	DLTUK
2.12	2	Transverse alignment ram Hose set 15m (TBC)	DLTC	DLTUK
2.13	2	Deck Leveling Ram ram Hose set 10m (TBC) – HPU to hose reeler		DLTUK
2.14	2	Deck Leveling Ram ram Hose reeler & twin hoses (10m) (spring recoil with	DLTC	DLTUK
		non-latching)		
2.15	1	DL-M2-2 Console	DLTC	DLTUK
2.16	2	DL-M control cables (type B) – 25m (Console to HPU hoist 1)	DLTC	DLTUK
2.17	2	DL-M control cables (type B) – 10m (HPU to Strand Jack)	DLTC	DLTUK
2.18	1	DL-M control cable (type B) – 80m (HPU1 to HPU2)	DLTC	DLTUK
2.19	1	E-stop cable 80m (HPU1 to HPU2)	DLTC	DLTUK
2.20	1	E-stop cable 25m (DL-M2-2 to HPU1)	DLTC	DLTUK
2.21	2	Power distribution cable from Rear Leg distribution board to Hoist	DLTC	DLTUK
		control cabinet (1No 70m, 1No 75m)		
2.22	2	Power distribution cable from Hoist control cabinet to HPU (7m)	DLTC	DLTUK
2.23	2	Control Cabinet to HPU data cable lead 8m	DLTC	DLTUK
2.24	1	Drag Chain Cable Management Track on runway beam for Power / PLC	DLTC	DLTUK
		data and DL-M data cables		
2.25	1	Strand Dispenser – Bridon Type	DLTUK	DLTUK
2.26	1	Tool box and c/w strand jack tool set	-	
2.27	72	Sticks Doorease	-	
2.28	12	110v Lighting units to cover Hoists and shine along runway beam	DLTC	DLTUK
2.29	2	DL-S294 Strand Jack fixed anchors housings	DLTUK	DLTUK
2.30	1	Lighting Protection System for Gantry with Earth spike – details as confirmed via TQ48	DLTC	DLTUK



By DLTUK

Item	Qty	Description	Detail	Design
			Design	Check
2.41	8	75-XOT Hilman Rollers	DLTUK	DLTUK
2.42	8	Fabreeka Elastomeric Pads (under Hilman skates)	DLTUK	DLTUK
2.43	16	Nylube Lateral guide plate for Hoist movement joint	DLTUK	DLTUK
		(drg D2338-7026)		
2.44	8	Deva.tex 542 slide pads for SJ carriage (Part DEVA8401 drg 8029)	DLTUK	DLTUK
2.45	4	Nylube lateral guide pads pads for SJ carriage	DLTUK	DLTUK
		(Part NYL8401 drg 8028)		
2.46	2000m	18mm strand (to form 4 x 19 x 25m strands)	DLTUK	DLTUK
2.47	4	Deva.tex 542 slide pads for SJ carriage (Part DEVA8402 drg 8029)	DLTUK	DLTUK
2.48	4	Nylube lateral guide pads pads for SJ carriage	DLTUK	DLTUK
		(Part NYL8402 drg 8028)		

Hoist Trolleys - Spares

By DLTC (Spares)

Item	Qty	Description
2.61	2	DL-S294 grip sets (57 grips per set)
2.62	1	DL-S294 Main seal set
2.63	4	DL-S294 Mini-jacks
2.64	1	DL-M electrical dressing & sensors sets
2.65	1	DL-S294 Main Cylinder CBV
2.66	1	DL-M cable B @ 25m
2.67	1	DL-M cable B @ 80m
2.68	1	E-stop cable @ 80m
2.69	1	Mini jack Hoses 10m (TBC) [2 hoses]
2.70	1	DL-S294 main cylinder extend and retract hose 10m (TBC)
2.71	1	Transverse alignment ram seal kit
2.72	1	Transverse alignment ram hose set 15m (TBC)
2.73	1	Deck Leveling Ram ram Hose set 10m (TBC)
2.74	1	DL-L50/1/300/E Main Pump
2.75	1	DL-L50/1/300/E Auxiliary Pump
2.76	1	Each type of DL-L50/1/300/E DCV
2.77	1	Each type of DL-L50/1/300/E PRV / hydraulic Control valve
2.78	2	Filter elements for each filter type
2.79	2	Each type of control relay
2.80	1	Each type of control switch and indicator light on local control panel
2.81	1	DL-M2-2 Control Console



By DLTUK (Spares)

Item	Qty	Description
2.91	1	75-XOT Hilman Rollers
2.92	1	Fabreeka Elastomeric Pads (under Hilman skates)
2.93	2	Nylube Lateral guide plate for Hoist movement joint (drg D2338-7026)
2.94	1	Deva.tex 542 slide pads for SJ carriage (Part DEVA8401 drg 8029)
2.95	1	Nylube lateral guide pads pads for SJ carriage (Part NYL8401 drg 8028)
2.96	1	Deva.tex 542 slide pads for SJ carriage (Part DEVA8402 drg 8029)
2.97	1	Nylube lateral guide pads pads for SJ carriage
		(Part NYL8402 drg 8028)

3 Rear Leg - Main Equipment

By DLTC

Item	Qty	Description	Detail	Design
			Design	Check
3.1	2	CY292-400-205 ram with CBV to full bore in cylinder mounted manifold	DLTC	DLTUK
		[Vertical Adjustment Ram]. Pressure transducer to full and annular		
		bore		
3.2	2	CY50-1400-271/156 ram with CBV to full and annular both in cylinder	DLTC	DLTUK
		mounted manifold [Launching Ram]		
3.3	1	L40/2/280/E hydraulic power pack	DLTC	DLTUK
3.4	1	Control cabinet with Master PLC & Wireless controller receiver	DLTC	DLTUK
3.5	4	700bar jack for adjusting tilt foot bridging piece (TBC)	DLTUK	
3.6	4	700bar jack for adjusting track alignment (TBC)	DLTUK	
3.7	2	700bar hand pump (TBC)	DLTUK	
3.8	2	Sensor dressing box for Vertical Adjustment Rams	DLTC	DLTUK
3.9	1	Control Cables from Vertical Adjustment Rams (Left) to HPU 15m	DLTC	DLTUK
3.10	1	Control Cables from Vertical Adjustment Rams (Right) to HPU 10m	DLTC	DLTUK
3.11	1	Control Cable from PLC to HPU 10m	DLTC	DLTUK
3.12	1	Hose set Rear leg vertical ram (Left) 20m (TBC)	DLTC	DLTUK
3.13	1	Hose set Rear leg vertical ram (Right) 10m (TBC)	DLTC	DLTUK
3.14	1	Hose set Rear leg launching ram (Left) 22m (TBC)	DLTC	DLTUK
3.15	1	Hose set Rear leg launching ram (Right) 12m (TBC)	DLTC	DLTUK
3.16	1	Diesel Generator	DLTC	DLTUK
3.17	1	Power distribution board	DLTC	DLTUK
3.18	1	Power cable generator to distribution board (length 13m)	DLTC	DLTUK
3.19	1	Power cable distribution board to Rear Leg HPU (length 10m)	DLTC	DLTUK
3.20	2	Power cable distribution board to Transporter (length 10m)	DLTC	DLTUK
3.21	6	Lighting units – 110v to cover platform areas and rear leg launching	DLTC	DLTUK
3.22	1	Wireless Control Unit (WCU)	DLTC	DLTUK
3.23	1	Generator Load Box	DLTC	DLTUK
3.24	1	Canvas Cover for Diesel Generator	DLTC	DLTUK
3.25	1	Back up control lead fro WCU (80m)	DLTC	DLTUK



By DLTUK

Item	Qty	Description	Detail	Design
			Design	Check
3.41	14	Fabreeka Elastomeric Pads 350x300x25 (Drg D2338-3324) (under launch beams)	DLTUK	DLTUK
3.42	8	Nylube Lateral guide plate (185x50x20) for launch shoe (ref drg D2338-3314)	DLTUK	DLTUK
3.43	4	Deva.tex 542 pad 200 diameter x 15 for Rear leg (ref drg D2338-3316)	DLTUK	DLTUK
3.44	4	Rubber pad (50+/-5 Shore A) Dia 220 x 20 (ref drg D2338-3315)	DLTUK	DLTUK
3.45	8	Fabreeka Pads for Rear Leg tilt foot bridging unit 550x150x25 (ref drg D2338-3233)	DLTUK	DLTUK

Rear Leg - Spares

By DLTC (spares)

Item	Qty	Description
3.61	1	CY292-400-240 ram seal kit
3.62	1	CY50-1400-271/156 ram seal kit
3.63	1	Rear Leg vertical ram Sensor dressing box
3.64	2	Pressure Transducers
3.65	1	CY250-400-240 CBV
3.66	1	Control Cables from Vertical Adjustment Rams (Right) to HPU 15m
3.67	1	Hose set Rear leg vertical ram (Left) 20m (TBC)
3.68	1	Hose set Rear leg launching ram (Left) 22m (TBC)
3.69	1	DL-L30/2/300/E Main Pump
3.70	1	DL-L30/2/300/E Auxiliary Pump
3.71	1	Each type of DL-L30/2/300/E DCV
3.72	1	Each type of DL-L30/2/300/E PRV / hydraulic Control valve
3.73	1	Filter elements for each filter type
3.74	2	Each type of control relay
3.75	2	Each type of control switch and indicator light on local control panel
3.76	1 Set	PLC spares (1No of each type of module to provide for whole gantry)
3.77	1	Wireless Control Unit (WCU)
3.78	1	Rotational encoder for Hoist Chain drive Motor/Gearbox

By DLTUK (Spares)

Item	Qty	Description
3.91	2	Fabreeka Elastomeric Pads 350x300x25 (Drg D2338-3324) (under
		launch beams)
3.92	2	Nylube Lateral guide plate (185x50x20) for launch shoe (ref drg
		D2338-3314)
3.93	2	Deva.tex 542 pad 200 diameter x 15 for Rear leg (ref drg D2338-3316)





3.94	2	Rubber pad (50+/-5 Shore A) Dia 220 x 20 (ref drg D2338-3315)
3.95	1	Fabreeka Pads for Rear Leg tilt foot bridging unit 550x150x25 (ref drg
		D2338-3233)



4 Middle Leg - Main Equipment

By DLTC

Item	Qty	Description	Detail	Design
			Design	Check
4.1	1	CY50/50-800-240/175 ram with CBV to full bore in cylinder mounted	DLTC	DLTUK
		manifold [Transverse Movement Ram].		
4.2	2	CY30/30-400-200/150 ram with CBV to full and annular both in cylinder	DLTC	DLTUK
		mounted manifold [Plan Rotation Ram]		
4.3	2	CY250-400-255 with 400te capacity when fully closed [Vertical	DLTC	DLTUK
		adjustment Rams] CBV to full bore in cylinder mounted manifold and		
		pressure transducers to full bore		
4.4	1	L10/2/250 hydraulic power pack	DLTC	DLTUK
4.5	1	Control cabinet with Slave PLC	DLTC	DLTUK
4.6		Control cable from PLC to HPU 10m	DLTC	DLTUK
4.7	2	Sensor dressing box for Vertical Adjustment Rams	DLTC	DLTUK
4.8	1	Control Cables from Vertical Adjustment Rams (Left) to HPU 15m	DLTC	DLTUK
4.9	1	Control Cables from Vertical Adjustment Rams (Right) to HPU 19m	DLTC	DLTUK
4.10	8	Proximity Switches (Middle leg separation)	DLTC	DLTUK
4.11	2	Middle Leg separation sensor / inclinometer dressing boxes	DLTC	DLTUK
4.12	4	Inclinometers (Middle Leg tipping)	DLTC	DLTUK
4.13	4	Data cables sensor dressing boxes to inclinometers	DLTC	DLTUK
		(refer to cable parts list)		
4.14	1	Data cables sensor dressing box (left) to Control Cabinet 8m	DLTC	DLTUK
4.15	1	Data cables sensor dressing box (right) to Control Cabinet 20m	DLTC	DLTUK
4.16	1	Hose set Plan Rotation ram (Left) 20m (TBC)	DLTC	DLTUK
4.17	1	Hose set Plan Rotation ram (Right) 6m (TBC)	DLTC	DLTUK
4.18	1	Hose set Transverse movement ram (Right) 6m (TBC)	DLTC	DLTUK
4.19	1	Hose set Plan Vertical adjustment ram (Left) 20m (TBC)	DLTC	DLTUK
4.20	2	Hose set Plan Vertical adjustment ram (Right) 15m (TBC)	DLTC	DLTUK
4.21	1	Festoon for PLC data and power cable (length 60m)	DLTC	DLTUK
4.22	1	Power cable RL distribution board to ML Cabinet via festoon (80m)	DLTC	DLTUK
4.23	1	Power cable ML cabinet to ML HPU (length 10m)	DLTC	DLTUK
4.24	6	Lighting units – 110v to cover platform areas and rear leg launching		

By DLTUK

Item	Qty	Description	Detail	Design
			Design	Check
4.41	8	Hilman Rollers – Type 150XOTLB with side and uplift rollers	DLTUK	DLTUK
4.42	8	Fabreeka Elastomeric Pads (under Hilman skates)	DLTUK	DLTUK
4.43	4	Nylube guide pads for 120 x 120 x 20 (ref drg D2338-4135)	DLTUK	DLTUK
4.44	8	Deva.tex 542 pad 180 diameter x 15 for Rear leg (ref drg D2338-4133)	DLTUK	DLTUK
4.45	8	Rubber pad (50+/-5 Shore A) Dia 200 x 20 (ref drg D2338-4134)	DLTUK	DLTUK
4.46	2	Fabreeka Elastomeric Pads 600x550x25 (ref drg D2338-4413)	DLTUK	DLTUK





4.47	2	Manual winches for Middle Leg Ram relocation (capacity 2te)	DLTUK	DLTUK
4.48	1	Manual winches for Middle Leg folding (capacity 5te)	DLTUK	DLTUK

Middle Leg - Spares

By DLTC (spares)

Item	Qty	Description
4.61	1	CY50-800-240/175 ram seal kit
4.62	1	CY30-400-200/150 ram seal kit
4.63	1	CY250/400/255 ram seal kit
4.64	1	Middle Leg separation sensor / inclinometer dressing boxes
4.65	2	Pressure Transducers
4.66	1	CY250/400/255 CBV
4.67	1	Data cables sensor dressing boxes to inclinometers
		(refer to cable parts list)
4.68	1	Data cables sensor dressing box (left) to Control Cabinet (20m)
4.69	1	Hose set Plan Rotation ram (Left) 20m (TBC)
4.70	1	Hose set Transverse movement ram (Right) 6m (TBC)
4.71	1	Hose set Rear leg launching ram (Left) 22m (TBC)
4.72	4	Proximity Switches
4.73	1	Inclinometers (Middle Leg tipping)
4.74	1	L10/2/250 Main Pump
4.75	1	L10/2/250 Auxiliary Pump
4.76	1	Each type of L10/2/250 DCV
4.77	1	Each type of L10/2/250 PRV / hydraulic Control valve
4.78	1	Filter elements for each filter type
4.79	2	Each type of control relay
4.80	2	Each type of control switch and indicator light on local control panel
4.81	1	PLC spares (??)

By DLTUK (Spares)

Item	Qty	Description
4.91	1	Hilman Rollers – 150XOTLB with side and uplift rollers
4.92	1	Fabreeka Elastomeric Pads (under Hilman skates)
4.93	4	Nylube guide pads for 120 x 120 x 20 (ref drg D2338-4135)
4.94	2	Deva.tex 542 pad 180 diameter x 15 for Rear leg (ref drg D2338-4133)
4.95	2	Rubber pad (50+/-5 Shore A) Dia 200 x 20 (ref drg D2338-4134)
4.96	1	Fabreeka Elastomeric Pads 600x550x25 (ref drg D2338-4413)



5 Front Leg - Main Equipment

By DLTC

Item	Qty	Description	Detail	Design
			Design	Check
5.1	2	CY112/600/178 with CBV to full bore in cylinder mounted manifold and	DLTC	DLTUK
		pressure transducers on both full and annular bore [Vertical Adjustment		
		Ram].		
5.2	1	DL-L10/2/200 HPU	DLTC	DLTUK
5.3	2	DL Sensor dressing box for Vertical Adjustment Rams	DLTC	DLTUK
5.4	2	Data cables Leg Ram sensor dressing box to HPU (16m / 18m)	DLTC	DLTUK
5.5	2	Hose set Leg Rams 10m (TBC)	DLTC	DLTUK
5.6	1	Control Cable HPU to Front Leg Control Cabinet 12m	DLTC	DLTUK
5.7	2	3te SWL chain drives units complete with electric motors and planetary	DLTC	DLTUK
		gear box		
5.8	2	Short pitched chain x TBC (approx) (type and length TBC to match item	DLTC	DLTUK
		5.7)		
5.9	2	Chain pulley	DLTC	DLTUK
5.10	1	Front Leg Control Cabinet containing Chain drive motor inverter drives	DLTC	DLTUK
		and slave PLC		
5.11	1	PLC cable from Rear Leg Master PLC to Front Leg control cabinet (80m)	DLTC	DLTUK
5.12	1	Wind Speed Anemometer and monitor station	DLTC	DLTUK

By DLTUK

Item	Qty	Description	Detail	Design
			Design	Check
5.41	2	Manual winches for Front Leg ram relocation (capacity 1.5te)	DLTUK	DLTUK
5.42	2	Manual winches for Front Leg folding (capacity 4te)	DLTUK	DLTUK
5.43	2	Fabreeka Elastomeric Pads 600x550x25 (ref drg D2338-5313)	DLTUK	DLTUK



Front Leg - Spares

By DLTC (spares)

Item	Qty	Description
5.61	1	CY112/600/178 ram seal kit
5.62	1	CY112/600/178 CBV
5.63	2	Pressure Transducers
5.64	1	DL Sensor dressing box for Vertical Adjustment Rams
5.65	1	Data cables Leg Ram sensor dressing box to HPU 18m
5.66	1	Hose set Leg Rams 10m (TBC)
5.67	1	DL-L10/2/200 Main Pump
5.68	1	DL-L10/2/200 Auxiliary Pump
5.69	1	Each type of DL-L10/2/200 DCV
5.70	1	Each type of DL-L10/2/200 PRV / hydraulic Control valve
5.71	1	Filter elements for each filter type
5.72	2	Each type of control relay
5.73	1	Each type of control switch and indicator light on local control panel
5.74	1	PLC spares (??)
5.75	1	Rotational encoder for ML Chain drive Motor/Gearbox

By DLTUK (Spares)

Item	Qty	Description
5.81	2	Fabreeka Elastomeric Pads 600x550x25 (ref drg D2338-5313)

NOTE - Not all cables are listed - for full set refer to Cables parts list on TQ068



2. Performance and Design Criteria

For Gantry

- D2338 Project Design Statement A2
- Mechanical Systems Specification Rev 0.2
- D2338 Gantry Control System Specification A3

For Transporter

DL-TLC500t Transporter PDS (2014.05.05) – Provided by Tolian

Paint

Strand jacks

Main Cylinder Colour – RAL 9016 – traffic white (DLT Standard)
Top / Base Anchor Colour - RAL3020 – traffic red (DLT Standard)
Manifolds - RAL3020 traffic red (DLT Standard)

Hydraulic Cylinders

Main Cylinder Colour – RAL 9016 – traffic white (DLT Standard) Manifolds - RAL3020 traffic red (DLT Standard)

HPU's

RAL3020 traffic red (DLT Standard)

3. Manufacturing Inspection and Test Plans

The following inspection and test plans should be followed:-

Item	ITP
DL-S294 Strand Jack	ITP-SJ
DL-CY43/29-440	ITP-Ram
DL-L50/1/300/E	ITP-PP
60te SWL twin wheel bogies	ITP-SW
18te SWL chain drives units	ITP-SW
CY43/29-240	ITP-Ram
CY292-400-205	ITP-Ram
CY50-1400-271/156	ITP-Ram
L40/2/280/E	ITP-PP
CY50/50-800-240/175	ITP-Ram
CY30/30-400-200/150	ITP-Ram
CY250-400-255	ITP-Ram
L10/2/250/E	ITP-PP
CY112/600/178	ITP-Ram
DL-L10/2/200	ITP-PP
3te SWL chain drives	ITP-SW



4. Approvals and Certification

FACTORY ACCEPTANCE TESTING Hydraulic Cylinders

Туре	Test	Procedure	Independent
			Witness
			Required
DL-CY43/29-440-275/275 (Hoist	1.5 x WP Pressure	D9140-MS-015	Yes
transverse alignment)			
CY43/29-240-275/275 (Deck leveling)	1.5 x WP Pressure	D9140-MS-015	Yes
DL-CY292/400/240 (RL Vertical)	1.5 x WP Pressure	D9140-MS-015	Yes
DL-CY50-1400-271/156	1.5 x WP Pressure	D9140-MS-015	Yes
(RL launching)			
DL-CY50/50-800-240/175	1.5 x WP Pressure	D9140-MS-015	Yes
(ML transverse)			
DL-CY30/30-400-150/200	1.5 x WP Pressure	D9140-MS-015	Yes
(ML rotation)			
DL-CY250/400/255 (ML vertical)	1.5 x WP Pressure	D9140-MS-015	Yes
CY112/600/178 (FL vertical)	1.5 x WP Pressure	D9140-MS-015	Yes

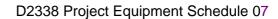
Hydraulic Power Packs

Туре	Test	Procedure	Independent
			Witness
			Required
Hoist DL-L50/1/300 HPU	Flow/Pressure/Function	D9140-MS-005	Yes
RL DL-L40/2/300/E	Flow/Pressure/Function	D9140-MS-005	Yes
ML DL-L10/2/250 HPU	Flow/Pressure/Function	D9140-MS-005	Yes
FL DL-L10/2/200 HPU	Flow/Pressure/Function	D9140-MS-005	Yes

Strand Jacks

Type	Test	Procedure	Independent
			Witness
			Required
DL-S294	1.5 x WP Pressure	D9140-MS-015	Yes
DL-S294	1.25 Static Load Test	D9140-MS-003	Yes
DL-S294	1.1 Dynamic Load Test	D9140-MS-011	Yes

Chain Drives





Туре	Test	Procedure	Independent
			Witness
			Required
Hoist Chain Drive	Function Test via WCU	TBC	No
Middle Leg Chain Drive	Function Test via WCU	TBC	No

Strand Jack System (DL-M)

Type	Test	Procedure	Independent
			Witness
			Required
DL-S294 + DL-L50/1 HPU and	Function Test	D9140-MS-011	No
DL-M2 control			

Gantry Control System (PLC)

Туре	Test	Procedure	Independent
			Witness
			Required
WCU Function Testing	Function Test	TBC	No
Local Pendent Function Testing	Function Test	TBC	No

DL-TLC500 Transporter

Туре	Test	Procedure	Independent
			Witness
			Required
Steering Ram Pressure Test	1.5 x WP Pressure	D9140-MS-015	No
Suspension Ram Pressure Test	1.5 x WP Pressure	D9140-MS-015	No
Outrigger Ram Pressure Test	1.5 x WP Pressure	D9140-MS-015	No
Transporter Trolley	Function Test	TBC	No
Transporter Function	Function Test	TBC	No

Hydraulic Hoses

Туре	Test	Procedure	Independent
			Witness
			Required
All Hydraulic Hoses – All systems	1.5 x WP Pressure Test	D9140-MS-022	Yes



5. Minimum Technical Review / Approvals

Transporter

Design review of structural drawings for

- Spine Beam
- Spine Beam quick connection
- · Suspension units
- Trolley

Design review of hydraulic and electrical drawings for transporter

HPUs

Design review of hydraulic and electrical schematics and hydraulic parts lists Design review of general arrangement of Hydraulic Power Pack

Hydraulic Rams

Design review of general arrangement drawings for Rams Design review of component drawings and sealing for Ram

Chain Hoists

Design review of general arrangement drawings for Chain Hoist Design review of component drawings and proposed parts for Chain Hoist

Control System

HV power distribution Schematic Control system network Schematic PLC logic diagrams



6. Equipment ID Plate

Item	ID Reference
Hoist Trolleys	
Strand Jack DL-S294	D2338-DL-S294-SJ-1410-01 to 02
Fixed Anchor DL-S294	D2338-DL-S294-FA-1410-01 to 02
Fixed Anchor Housing DL-S294	D2338-DL-S294-FAH-1410-01 to 02
HPU	D2338-DL-L50/1/300-1410-01 to 02
DL-CY43-440-275 hydraulic cylinders	D2338-DL-CY43/29-440-275/275-1410-01 to 02
DL-CY43-240-275 hydraulic cylinders	D2338-DL-CY43/29-240-275/275-1410-01 to 02
60te SWL twin wheel bogies	D2338-DL-BU60-1410-01 to 16
18te SWL chain drives units	D2338- DL-CD18-1410-01 to 4
DL-M2-2 Console	D2338-DL-M2-1410-01
Strand Dispenser	D2338-DL-SD-1410-01
Hoist Control Cabinet	D2338-DL-HOISTCC-1410-01 to 02
Rear Leg	
CY292/400/240 hydraulic cylinders	D2338-DL-CY292-400-240-1410-01 to 02
CY50/1400/271-156 hydraulic cylinders	D2338-DL-CY50-1400-271/156-1410 01 to 02
L40/2/300/E	D2338-DL-L40/2/300-1410-01
Control cabinet with Master PLC	D2338-DL-REARCC-1410-01
Transporter Trolley control cabinet	D2338-DL-TRANSTROLLEYCC-1410-01
Middle Leg	
CY50/800/240-175	D2338-DL-CY50/50-800-240/175-1410-01
CY30/400/200-150	D2338-DL-CY30/30-400-150/200-1410-01 to 02
CY250/400/255	D2338-DL-CY250/400/255-1410-01 to 02
L10/2/250 HPU	D2338-DL-L10/2/250-1410-01
Middle Leg Control cabinet	D2338-DL-MIDDLECC-1410-01
Front Leg	
CY112/600/178	D2338-DL- CY112/600/178-1410-01 to 02
DL-L10/2/200 HPU	D2338-DL-L10/2/200-1410-01
3te SWL chain drives	D2338- DL-CD3-1410-01 to 2
Front Leg Control Cabinet	D2338-DL-FRONTCC-1410-01



7. Pre-delivery valve settings

Relief valve arrangement taken from Drawing revision shown in brackets next to HPU name i.e. (A5) = revision A5

Equipment	Valve	Ref	Setting (bar)
Hoist DL-L50/1/300 HPU	Strand Jack Extend RV	53.2	320
(A5)			
	Strand Jack Retract EV	51	150
	Panel Mounted RV	54	300
	System RV	53.1	300
	Leveling / Transverse Ram RV	52	285
	Mini Jack RV	45	50
DL-S294	Annular RV	81	300
	Counter Balance Valve	75	365 (1.3WP)
Leveling Ram	Counter Balance Valves 2No	37	360 (1.3WP)
Transverse Ram	Counter Balance Valves 2No	37	360 (1.3WP)
RL DL-L40/2/300/E	System RV (acting as Launch Ram Extend RV)	52.2	280
	Launch Ram Retract RV	51.4	165
	Vertical Ram Extend RV	53.2	265
	Vertical Ram Retract RV	51.3	110
Launch Ram	CBV Extend	38.3	200 (1.3WP)
	CBV Retract	38.4	350 (1.3WP)
Vertical Ram	CBV Extend	39.4	130 (1.3WP)
	CBV Retract	39.3	330 (1.3WP)
	Annular Relief Valve	81.2	300
ML DL-L10/2/250 HPU	System RV (acting as	52.1	250
(A5)	transverse extend RV)		
	Transverse Retract RV	53.1	185
	Plan Rotation Extend RV	53.2	160
	Plan Rotation Retract RV	51.1	210
** This valve could be removed **	Vertical Adjustment Extend RV	53.3	250
Transverse Movement Ram	CBV	38.1	230 (1.3WP)
Plan Rotation Ram	CBV Extend	38.3	195 (1.3WP)
	CBV Retract	38.2	260 (1.3WP)
Vertical Ram	CBV Extend	38.4	310 (1.3WP)
	CBV Retract	38.5	310 (1.3WP)
	Annular RV	81	300
FL DL-L10/2/200 HPU	System RV (acting as Ext and	52	190



	Ret RV)		
Vertical Ram	CBV Extend	38.1	260 (1.3WP)
	CBV Retract	38.2	260 (1.3WP)
	Annular RV	81	300

8. <u>Documentation Deliverables (to Customer)</u>

Operation and Assembly Manual for Gantry
Operation and Maintenance Manual for Gantry Mechanicals
Operation and Maintenance Manual for DL-TLC500 Transporter

Calculations

No specific requirement to submit mechanical system calculations to the Clients, however DLT need to have sufficiently detailed calculations to demonstrate that the system has been designed to comply with European standards

9. Operation and Maintenance Manual Headings

Section	Description
Volume 1	Introduction & Gantry Control System
1A	Introduction
1B	Control System and Sensor Installation
1C	Control system Operation
1D	PLC Control Cabinets and Software Operation
1E	Rear leg Control Cabinets
1F	Middle Leg Control Cabinet
1G	Front Leg Control Cabinet
1H	Hoist Trolley Control Cabinet
1J	WCU and Pendant Controller
1K	Sensors
1L	Generator and Power Distribution
1M	Gantry Lighting
Volume 2	Hoist Lifting System
2A	Introduction
2B	Equipment Installation and Commissioning
2C	DL-S294 Strand Jack
2D	DL-L50/1/300E Hydraulic Power Pack
2E	DL-M Control System
2F	Transverse alignment Ram (CY43-440-275)
2G	Deck Levelling Ram (CY43-240-275)



2H	Hoses and Reels
2J	Strand
2K	Certificates
Volume 3	Hoist Movement System
3A	Introduction
3B	Equipment Installation and Commissioning
3C	Chain Drives
3D	Hoist Unit Free end movement joint
Volume 4	Rear Leg Mechanical Systems
4A	Introduction
4B	Equipment Installation and Commissioning
4C	CY292/30/400/240 Vertical adjustment Ram
4D	Launching system (including CY50-1400/271-156 Ram
	and walking foot)
4E	L40/2/300/E hydraulic power pack
4F	Hoses
4G	Certificates
Volume 5	Middle Leg Mechanical Systems
5A	Introduction
5B	Equipment Installation and Commissioning
5C	CY30/30-400-150/200 Plan Rotation Rams
5D	CY50/50-800-240/175 Transverse Alignment Ram
5E	CY250/400/255 Vertical Adjustment Ram
5F	L10/2/250 hydraulic power pack
5G	Hoses
5H	Chain Drive system
5J	Movement Skates
5K	Manual Winches for leg folding
5L	Certificates
Volume 6	Front Leg Mechanical Systems
6A	Introduction
6B	Equipment Installation and Commissioning
6C	CY112/600/178 Vertical Adjustment Rams
6D	DL-L10/2/200 HPU Hydraulic Power Pack
6E	Hoses
6F	Manual Winches for leg folding
6G	Certificates

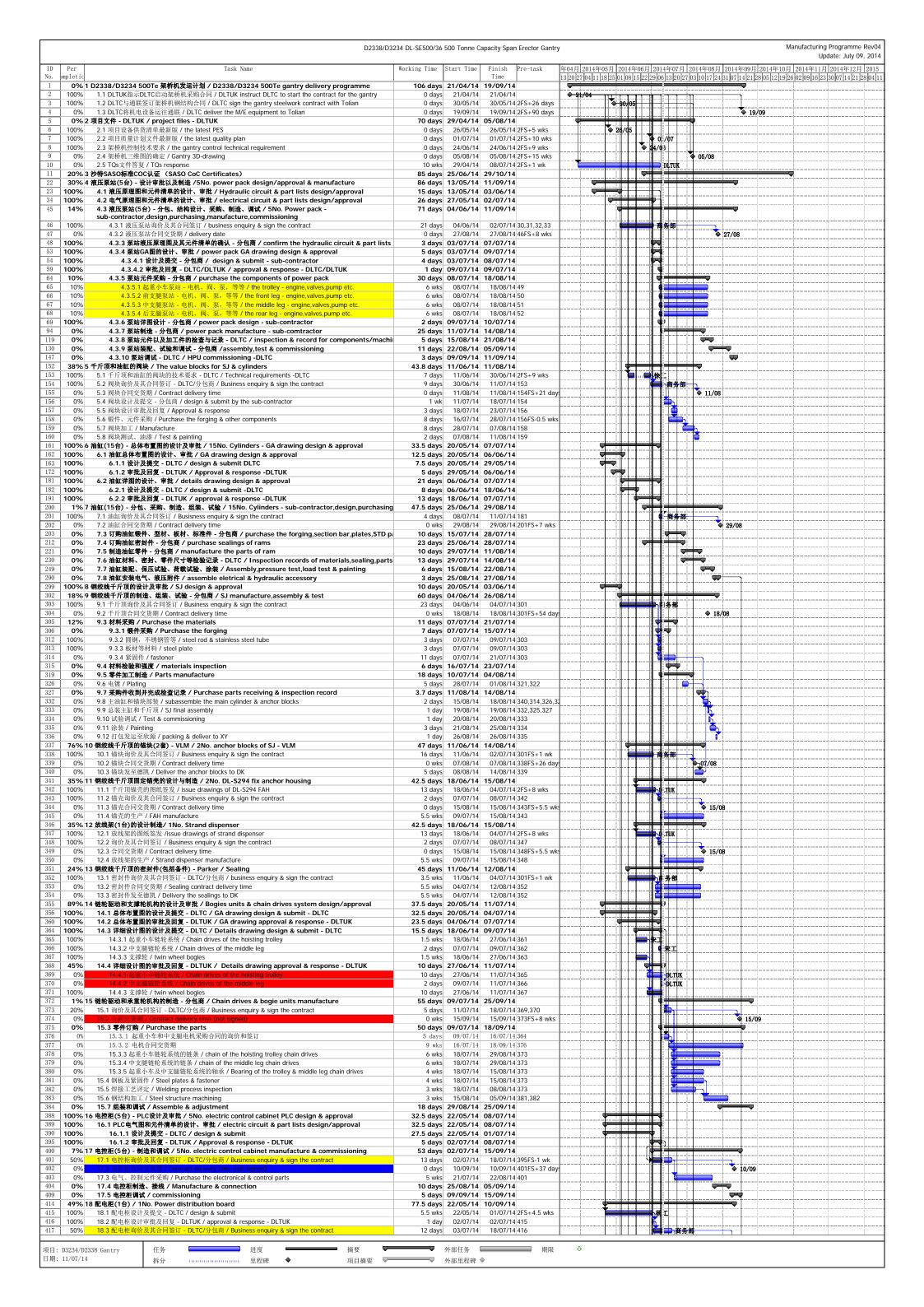


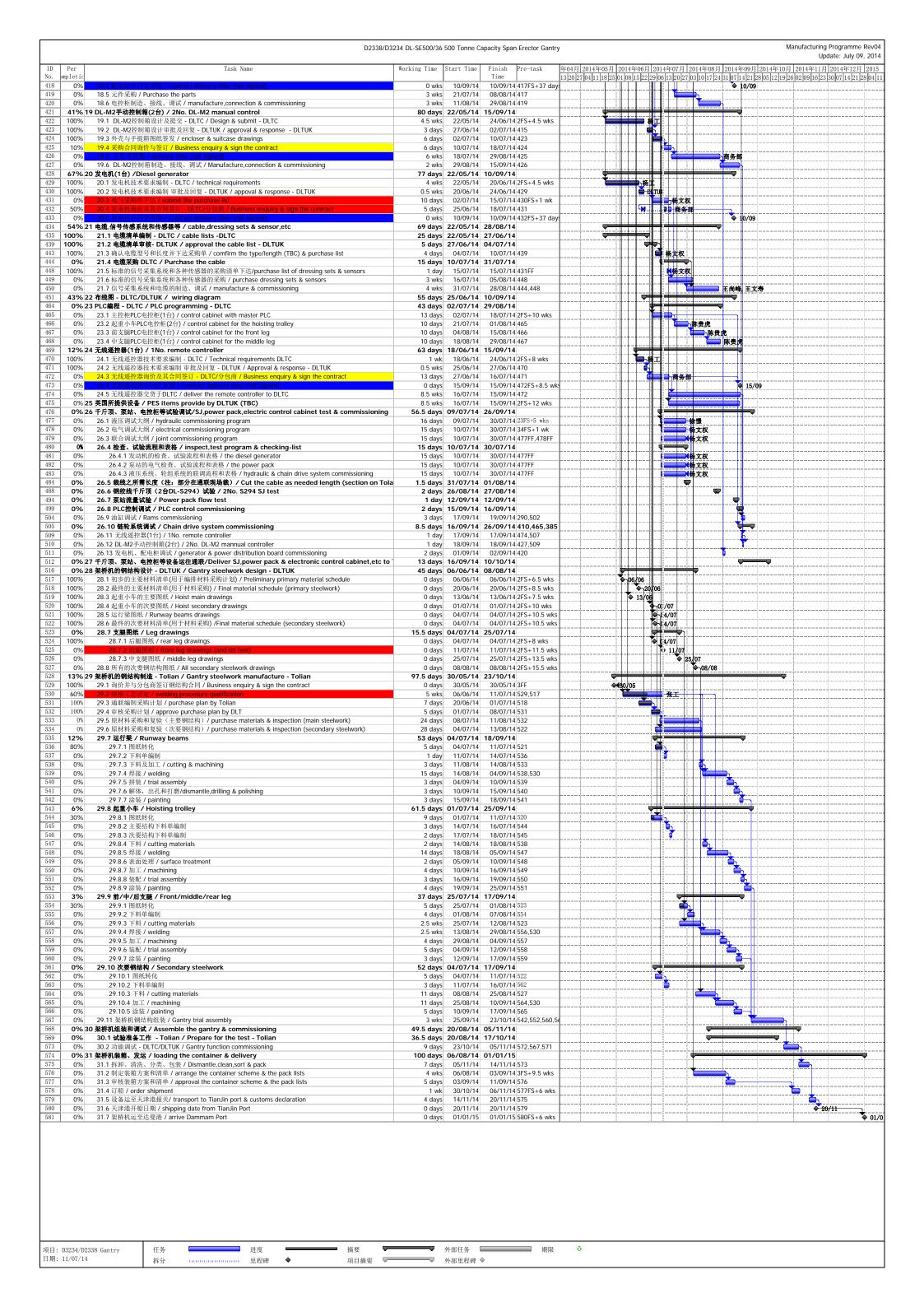
Volume 7	DL-TLC500 Transporter

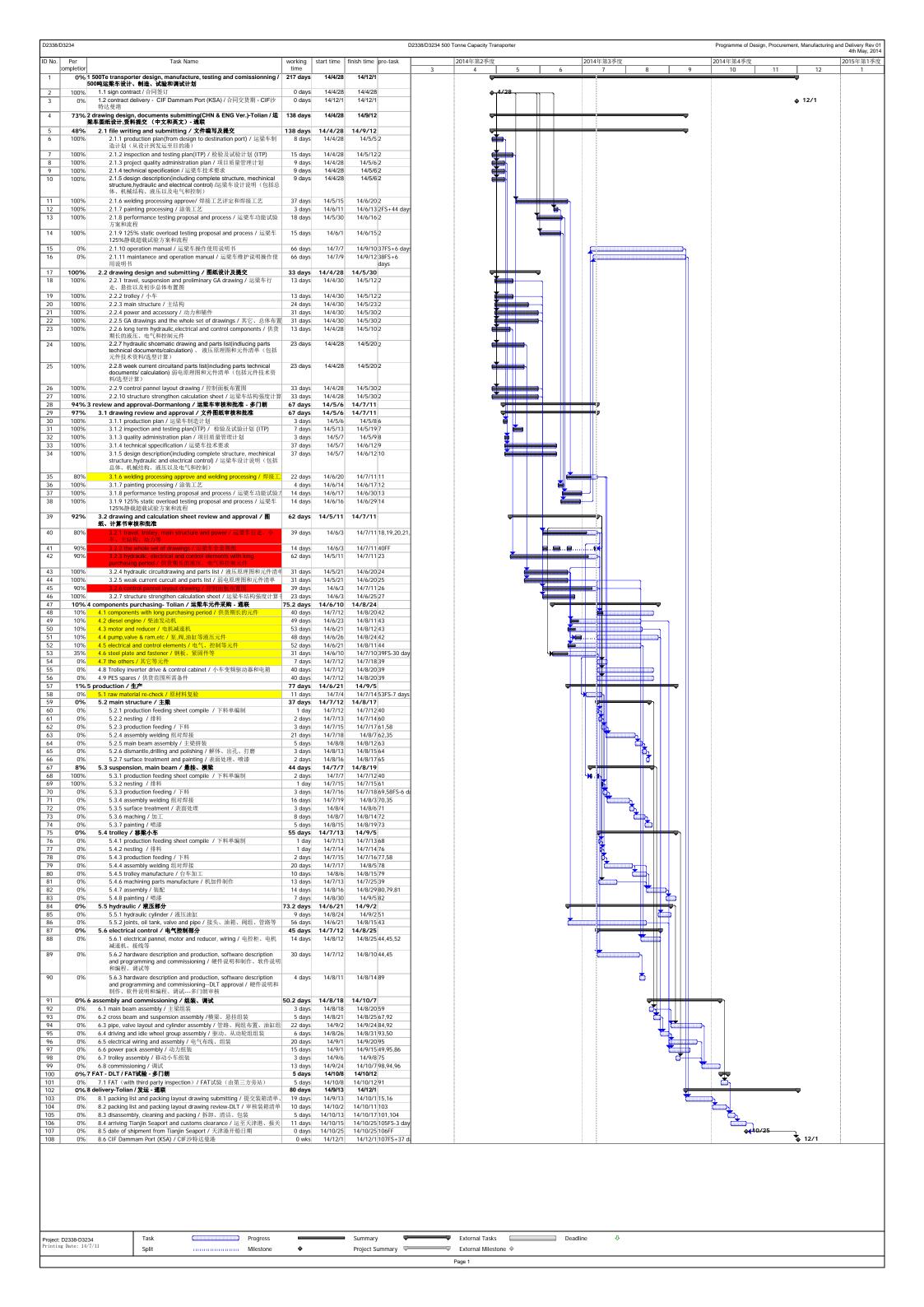


Appendix 2 – Manufacturing Programme Example

QC-GEN-001 I2 11 of 14









Document Ref : QC/GEN/001

Appendix 3 - Standard ITPs

Document No	Standard Equipment Testing Method Statement Title
ITP-SJ	Inspection and Test Plan - Manufacture of Strand Jacks
ITP-Ram	Inspection and Test Plan - Manufacture of Hydraulic Rams
ITP-PP	Inspection and Test Plan - Manufacture of Power packs
ITP-SW	Inspection and Test Plan - Manufacture of Steelwork

QC-GEN-001 I2 12 of 14



Appendix 4 Project As-built Quality File

Below is a list of the typical quality control documents that might be included in the Project As-built Quality File (Example is for fabricated steelwork):-

- Material certificates
- Heat Treatment records
- Welding procedures
- Welding and material NDT records
- Corrosion protection records
- Dimensional Control records
- NCR register
- Fastener certification
- Dimension control records
- Trial Assembly records
- Certificate of Conformity

QC-GEN-001 I2 13 of 14



Appendix 5 - List of standard Equipment Testing Method Statements

Note; where a standard Equipment Testing Method Statement does not exist, then project specific method statement will be developed. The scope of the required factory acceptance testing is defined in the Project Equipment Schedule.

Document No	Standard Equipment Testing Method Statement Title
D9140-MS-003	Strand Jack Load Test
D9140-MS-004	Climbing Jack Load Test
D9140-MS-005	Hydraulic Power Pack Inspection and Test
D9140-MS-008	Set –Up and Operation of DL-P40 v3 Control System
D9140-MS-009	Set –Up and Operation of DL-M Control System
D9140-MS-011	Dynamic Strand Jack Test
D9140-MS-012	Dynamic Climbing Jack Test
D9140-MS-013	Control System Testing
D9140-MS-015	Hydraulic Cylinder Pressure Testing
D9140-MS-018	Jacking System Test
D9140-MS-019	700bar Cylinder Pressure Test
D9140-MS-020	Bullet Fixed Anchor Housing Load Test
D9140-MS-021	Hydraulic Cylinder Cycle Testing
D9140-MS-022	Hydraulic Hose Test

QC-GEN-001 I2 14 of 14