TWEED SHIRE COUNCIL

MECHANICAL DESIGN SPECIFICATION

ME01

GENERAL MECHANICAL

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APPENDICES

ABBREVIATIONS

ABBREVIATION	INTERPRETATION
ABS	Acrylonitrile Butadiene Styrene
AOP	Allowable Operating Pressure
AS/NZS	Australian / New Zealand Standard
BCA	Building code of Australia
DA	Development Approval
DICL	Ductile Iron Cement Lined
DIEL	Ductile Iron Epoxy Lined
DN	Nominal Diameter
EN	European Standard
FBPE	Fusion Bonded Polyethylene (“Sintakote”)
GRP	Glass Reinforced Plastic
KL	Kilolitre
KPA	Kilopascal
KW	Kilowatt
L/S	Litres per second
MA	Milliamps
MAOP	Maximum Allowable Operating Pressure
MPA	Megapascal
NPSHA	Net Positive Suction Head Available
NPSHR	Net Positive Suction Head Required
P&ID	Process and Instrumentation Diagram
PLC	Programmable Logic Controller
PN	Nominal Pressure Class
PVC	Polyvinylchloride
PVC-M	Polyvinylchloride modified

ABBREVIATION	INTERPRETATION
PVC-O	Polyvinylchloride orientated
PVC-U	Polyvinylchloride unplasticised
RPZD	Reduced Pressure Zone Device
RRJ	Rubber Ring Joint
SCADA	Supervisory Control and Data Acquisition
SCL	Steel Cement Lined
SEL	Steel Epoxy Lined
SS	Stainless Steel
WSAA	Water Services Association of Australia
WS-SPEC	Water Services Specification

1 CITATION

This document is named "Tweed Shire Council, Mechanical Design Specification ME01 – General Mechanical Specifications".

This document has the following functions:

- To relate to and comply with Tweed Shire Council's Land Development Specifications D11, D12, C401 and C402.
- To nominate the Water Services Association of Australia (WSAA) Codes and associated documents as the general requirements to be met for the Asset Creation process within the Tweed Shire Council Area of jurisdiction.
- To specify parameters, requirements and functions contained within the Codes that Council is to nominate or to amend.
- To specify additional technical and/or administrative matters (that are not otherwise specified within Australian Codes or Standards) pertaining to NSW Government Department of Planning.
- To specify any technical requirements not covered by the Codes.
- To identify materials, solutions and methods permitted by the Codes that are not acceptable to Council.
- To specify preferred options where the Codes provide for several methods to deal with a particular issue.

This document, as a Specification, is based upon compliance with the Sewerage Code of Australia (WSA-02), Water Supply Code of Australia (WSA-03) and the Sewage Pumping Station Code of Australia (WSA-04) and is complimented by the strategic product specifications and technical requirements contained within WS-SPEC National Water Industry Specifications.

WSA-02, WSA-03 & WSA-04 are available from the Water Supply Association of Australia (WSAA), email: info@wsaa.asn.au,

WS-SPEC and Australian Standards are available from the Saiglobal webshop at www.saiglobal.com/shop.

For all design and construction contracts, all alternatives to these specifications will require specific approval of Tweed Shire Council.

2 ORIGIN OF DOCUMENT, COPYRIGHT

This document was originally produced for Tweed Shire Council. This document is copyright to Tweed Shire Council.

3 VERSIONS

VERSION	AMENDMENT DETAILS	CLAUSES AMENDED	DATE ISSUED (The new version takes effect from this date)	Authorised by the Director of Engineering Services
1.1	Draft for review		10-Sept-2007	
1.2	Draft with Upgrades for review	All	18-Aug-2008	

4 DEFINITIONS

In this document:

"Standard" shall mean and include a Standard Specification, Standard Code of Practice or other Standard issued by a recognised association or body set up for the purpose.

"Australian Standard" or the abbreviation "AS" shall mean a Standard issued by the Standards Association of Australia.

"Draft Report" or the abbreviation "DR" shall mean a draft of an Australian Standard issued by the Standards Association of Australia.

"British Standard" or the abbreviation "BS" shall mean a Standard issued by the British Standards Association.

"International Standard" or the abbreviation "ISO" shall mean a Standard issued by the International Standards Organisation.

"Principal " – The Principal is as defined in GC21 and is Tweed Shire Council.

"Principals' Authorised Person" - is as defined is GC21

"Contractor" denotes the person or corporation bound to execute construction and related work on behalf of the Principal.

"Designer" means a company, consultant or Professional Engineer who is qualified and is competent to perform the engineering works required for the Asset Creation process on behalf of a Developer.

"The Code" means the Water Services Association Codes (Sewerage Code of Australia (WSA-02) and the Sewage Pumping Station Code of Australia (WSA-04) and Water Supply Code of Australia (WSA-03), Vacuum Sewerage Code (WSA 06) and Pressure Sewerage Code of Australia (WSA 07))

"WS-SPEC" means the national standard water industry specifications.

5 SCOPE

The intent of this Standard Specification is to provide a means of ensuring a uniform approach to and standardisation of the design and installation of mechanical equipment.

All works specified within this document shall be a minimum requirement.

All other mechanical specifications (IE ME xx) shall include:

- Preparation and supply of 3 hard copies and 3 electronic copy of operation and maintenance manuals.
- Supply of detailed installation drawings, installation instructions and commissioning procedures.

6 ORDER OF PRECEDENCE

Where discrepancy or contradiction in documentation may occur, the order of precedence for documents specifying the works to be undertaken (from highest to lowest order of precedence) shall be as follows:

(a) Tweed Shire Council Land Development Specifications D11, D12, C401 and C402.
(b) This specification.

(c) Water Services Association Codes (Sewerage Code of Australia (WSA-02) and the Sewage Pumping Station Code of Australia (WSA-04) and Water Supply Code of Australia (WSA-03))
(d) WS-SPEC

7 STANDARDS

The Principal shall possess, or have access to; the latest edition of all documents required to comply with this Specification, including all current amendments and supplements of those documents. The Contractor shall include all relevant specifications and requirements of these documents into the design of the works.

a) Council Land Development Specifications

Development Design Specification – D11 Water Supply

Development Design Specification – D12 Sewerage System

Development Construction Specification – C401 Water Reticulation

Development Construction Specification – C402 Sewerage System

b) WSAA Codes of Practice,

WSA-02 – Sewerage Code of Australia

WSA-04 - Sewage Pumping Station Code of Australia

WSA -03 – Water Supply Code of Australia

c) WS-SPEC Water Services Specification,

d) Australian Standards

References in this Specification or the Drawings to Australian Standards are noted by their prefix AS or AS/NZS

The Designer shall use the latest edition of all relevant Australian Standards, including all current amendments, supplements and replacements applicable thereto.

Australian Standards are listed within WSA-02, WSA-04 and WSA-03.

The following Australian Standards with latest amendments are applicable to the materials and works covered by this Specification.

AS 1100	Technical drawing - general principles
AS 1101	Graphic symbols for general engineering - Hydraulic and pneumatic systems
AS 1102	Graphical symbols for electrotechnical documentation - General information and general index
AS 1104	Informative symbols for use on electrical and electronic equipment
AS 1111.1	ISO metric hexagon bolts and screws - Product grade C - Bolts
AS 1111.2	ISO metric hexagon bolts and screws - Product grade C - Screws
AS 1112.1	ISO metric hexagon nuts - Style 1 - Product grades A and B
AS 1112.2	ISO metric hexagon nuts - Style 2 - Product grades A and B
AS 1112.3	ISO metric hexagon nuts - Product grade C
AS 1112.4	ISO metric hexagon nuts - Chamfered thin nuts - Product grades A and B
AS 1214	Hot-dip galvanized coatings on threaded fasteners (IS0 metric course thread series)
AS 1217	Acoustics – Determination of sound power levels of noise sources
AS 1237	Plain washers for metric bolts, screws and nuts for general purposes - General plan
AS 1252	High strength steel bolts with associated nuts and washers for structural engineering
AS 1319	Safety Signs for the Occupational Environment
AS 1379	Specification and supply of concrete
AS 1418 Set	Cranes, hoists and winches Set
AS 1442	Carbon steels and carbon manganese steels – Hot rolled bars
AS 1443	Carbon steels and carbon manganese steels – Cold finished bars
AS 1532	Short pitch transmission precision roller chains and chain wheels
AS 1554 Part I	Structural steel welding
AS 1565	Copper and copper alloys - Ingots and castings
AS 1594	Hot rolled steel flat products
AS 1627 Part 4	Metal finishing - preparation and pretreatment of surfaces abrasive blast cleaning
AS 1646.1	Elastomeric seals for waterworks purposes - General requirements
AS 1646.2	Elastomeric seals for waterworks purposes - Material requirements for pipe joint seals used in water and wastewater applications - Specifies by prescription formulation
AS 1646.3	Elastomeric seals for waterworks purposes - Material requirements for pipe joints seals used in water and wastewater applications with the exception of natural rubber and polyisoprene compounds
AS 1646.4	Elastomeric seals for waterworks purposes - Material requirements for pipe joint seals used in water and wastewater applications - Thermoplastic elastomers and vulcanizates
AS 1657	Fixed platforms, walkways, stairways and ladders - Design, construction and installation
AS 1796	Certification of welders and welding supervisors
AS 1830	Grey cast iron

AS 1831	Ductile cast iron
AS 1832	Iron castings – Malleable cast iron
AS 2074	Cast steels
AS 2129	Flanges for pipes, valves and fittings
AS 2417	Pumps –International acceptance codes
AS 2528	Bolts, stud bolts and nuts for flanges and other high and low temperature applications.
AS2550	Cranes, hoists and winches - Safe use - General requirements
AS 2566	Buried flexible pipelines - Structural design
AS 2625	Mechanical vibration - Evaluation of machine vibration by measurements on non-rotating parts - General guidelines
AS 2700	Colour standards for general purposes
AS 2729	Rolling bearings - Dynamic load ratings and rating life
AS 2784	Endless wedge belt and V-belt drives
AS 3600	Concrete structures
AS 3610	Formwork for concrete
AS 3678	Structural steel-Hot-rolled plates, floorplates and slabs
AS 3972	Portland and blended cements
AS 4100	Steel structures
AS 4671	Steel reinforcing materials
AS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
ASTM A240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A276	Standard Specification for Stainless Steel Bars and Shapes
ASTM A480	Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
IS EN 10088-2	Stainless Steels - Part 2: Technical Delivery Conditions For Sheet/plate And Strip Of Corrosion Resisting Steels For General Purposes

8 EQUIPMENT SAFETY

8.1 General

All equipment shall be designed to afford maximum protection and a safe working environment for operating personnel.

Grilles, bars or mesh shall be provided behind covers where moving equipment may be reached. Alternatively, interlocks shall be provided to stop equipment in the event that covers are opened.

Fire protection facilities shall be provided to meet the requirements of the Work Cover Authority of NSW, the NSW Fire Brigade, Building Code of Australia and the Occupational Health and Safety Act.

The Contractor must work in a safe manner at all times. No work must be carried out unless specifically authorised.

The Contractor must observe all local safety procedures.

The Contractor must comply with the relevant NSW Workplace Health and Safety Act and Regulations currently in force.

A risk assessment approach is needed during designing access for maintenance purposes and also during installation or replacement of equipments.

Design and construction of infrastructure shall be planned and executed to minimise impact on the environment. Where a choice of alternative solutions is possible, an objective environmental risk assessment shall be undertaken to give due weight to reducing the risks to the environment resulting from the construction and operation of the infrastructure.

8.2 Guards

All exposed moving parts shall be provided with guards in accordance with the statutory requirement to afford maximum protection and a safe working environment for operating personnel staff and visitors. Guards shall be provided for protecting personnel against exposed moving parts and hot surfaces. Guards shall be easily removable by standard tools for maintenance access. The Contractor shall provide the necessary safety interlock devices to facilitate protection of operating personnel, as well as to prevent damage to the mechanical portions of the equipment.

Guards shall be galvanised after fabrication and shall be designed to facilitate maintenance of the equipment. In addition all equipment and guards shall be painted to the required colour coding to comply with the Australian Standards.

All drive guards shall be fabricated such that the guards can be removed without disturbing the sensing devices, chain or belt tensioners, field instruments and lubricators.

8.3 Safety signs

The Contractor shall supply and install all safety and warning signs as required. Safety signs shall comply with AS 1319.

The signs shall warn of potential hazards, assist in preventing accidents and give operational and emergency procedures for potentially hazardous situations. Signs shall provide warnings where equipment may start automatically, where equipment may move without warning and where other potential hazards may occur.

Warning sirens and beacon lights shall be installed for equipment where there is a hazard, such as when equipment starts automatically or when equipment fails to start.

The contents of piping, conduits and ducts shall be identified as per AS 1345. Arrows shall be provided to show the direction of flow.

8.4 Fail safe

All items of equipment shall be designed for safe operation.

Machinery shall be designed to ensure that the plant will remain in a safe condition in the event of any failure in part of the machinery or its associated safeguards, control circuits or its power supply.

9 DESIGN LIFE

Unless stated otherwise in this specification, all equipment and materials shall be designed and constructed to have a working life of at least 25 years when operating at ½ time.

Valves and pipework shall be designed and constructed to have a design life of at least 50 years.

Structures of concrete and steel shall be designed and constructed to have a design life of at least 50 years.

10 MATERIALS

All materials used in the Works shall be new and handled, transported and stored in accordance with the relevant Australian Standards and the manufacturer's recommendations.

Materials shall be obtained from an approved manufacturer or supplier.

The Contractor shall remove defective materials and materials not conforming to the requirements of this Specification. The Works shall be made good at the Contractor's expense.

Materials shall be selected appropriate to the application and installed environment to afford a long life free from corrosion and wear and with the required strength.

Other than for equipment so approved by the Principal's Authorised Person, all materials in contact with sewage, screenings, grit and sludge shall be of an appropriate grade of stainless steel grade 316, or a non-metallic corrosion and ultra-violet resistant material such as FRP, ABS or equivalent. Marine grade aluminium may be utilised in other corrosive areas such as walkways and access platforms.

Mechanical equipment of mild steel construction shall be hot dip galvanised. This includes pipe and machinery supports, platforms, stairs, handrails, baseplate, covers, and other items as specified.

Structural steel shall comply with the requirement of AS3678.

Galvanising shall comply with the requirements of AS/NZS 4680.

11 CORROSION PROTECTION

Where dissimilar metal surfaces come in contact that is not compatible, protection shall be provided by an insulation gasket and washers between the dissimilar metals.

Refer to Tweed Shire Council Standard specification for Corrosion Protection for Electrical and Mechanical Equipment Structures-EL06 for specific applications.

The Designer shall show on the Drawings the extent of external corrosion protection required to be provided by the Contractor.

Ductile iron pipework shall be provided with protective polyethylene sleeving wrapped and taped in accordance with the pipeline manufacturers instructions or epoxy coating as specified in the design.

Steel pipe work shall be protected by fusion bonded polyethylene (FBPE, known commercially as Sintakote) or epoxy coating. At welded joints, the pipeline shall be protected from corrosion by the application of either polyethylene heat shrink sleeves or by a suitable tape wrap system in accordance with the manufacturer's installation requirements.

The Designer shall assess the need for cathodic protection (sacrificial anode or impressed current) for metallic piping systems based on the aggressivity of the soil and groundwater characteristics along the alignment of a proposed pipeline and with particular reference to construction through old landfill sites, low lying anaerobic wetlands and coastal/tidal areas. The assessment of the aggressivity of the soil will be part of the geotechnical investigations for the work and the Designer will assess the geotechnical advice to determine whether cathodic protection is required.

Galvanised surfaces shall not be repaired with zinc rich paint (Cold Gal) alone. A full painting system shall be used where repairs to galvanised surfaces is required. The approval of the Principal's Authorised Person shall be obtained before repairing a galvanised surface with a paint system.

12 PAINTING AND COATINGS

12.1 General

Refer to Tweed Shire Council Standard specification-Corrosion Protection for Electrical and Mechanical Equipment Structures-EL06.

Where practicable, each succeeding coat of paint shall be of a different colour. Finish colours shall be as specified or as otherwise agreed with th Principal's Authorised Person.

Each coat shall produce a minimum dry film thickness as specified. In areas where this thickness is not developed, sufficient additional coats shall be applied to produce it.

Where alternative painting systems are specified, selection from among the alternatives is at the Contractor's option and subject to approval of the Principal's Authorised Person.

The Contractor may substitute other paint materials for those specified only with written approval from the Principal's Authorised Person.

Unless otherwise approved by the Principal's Authorised Person in writing, all coatings applied under a single paint system shall be the product of a single manufacturer.

Manufacturer's printed instructions shall be strictly followed in the application of proprietary coatings.

Care shall be exercised not to damage adjacent work during sandblasting operations. Any damage shall be made good to satisfaction of Principal's Authorised Person. Blasted surfaces shall not be left overnight before coating.

Paint shall not be applied in extreme heat, cold or in dust or smoke laden air, or in damp or humid weather.

Drying times shall be not less than called for in manufacturer's printed instructions.

Stainless steel surfaces shall not be painted.

Drop cloths shall be placed where required to protect floors and equipment from splatter and droppings.

Spray painting shall be conducted under controlled conditions, and the Contractor shall be fully responsible for any damage to adjacent work or adjoining property occurring from spray painting.

The Principal's Authorised Person shall be notified when each coat has been applied. Each coat may be inspected by the Principal's Authorised Person prior to application of the next coat. Areas found to contain runs, overspray, roughness, or other signs of improper application shall be required to be recoated in accordance with the Principal's Authorised Person's instructions.

The Contractor shall provide forced air ventilation, in accordance with applicable regulations, while work is being accomplished inside a tank or other closed area.

Colour samples and stain samples shall be submitted as required by the Principal's Authorised Person.

Except where factory application of finish coatings is permitted elsewhere in these Specifications or by the Principal's Authorised Person in writing, all items of equipment shall be finish-painted after installation with the colour selected or approved by the Principal's Authorised Person. Shop priming will be permitted in all cases. Materials and application as specified herein shall govern regardless of whether coatings are factory-applied or field-applied. After installation, any damaged areas in prime or finish coatings shall be repaired as directed by the Principal's Authorised Person.

All painting and coating systems used shall meet health and environmental requirements of the application. Particular notice shall be made for potable water applications.

Contractor shall be responsible for ensuring all spills over applications and damage caused during the work are to be rectified prior to completion.

12.2 Proprietary Equipment

All proprietary mechanical equipment, such as pumps, motors, gearboxes and conveyors, whether the equipment is fully immersed or not, shall satisfy the requirements of the 'Painting and Coatings' section of this specification. Where necessary, painting and coatings on proprietary equipment shall be upgraded. Care shall be exercised to protect all instruments, bearings, and all operational parts from contamination and damage when applying the paint system.

13 FASTENERS

Bolts and screws shall be in accordance with AS 1111.1 and AS 1111.2, respectively. Washers shall be in accordance with AS1237. Nuts shall be in accordance with AS 1112.1, AS1112.2, AS1112.3 and AS1112.4.

Extensive use of stainless steel, especially for nuts, bolts and screws shall be adopted for components coming in contact with influent or effluent water or exposed to a corrosive environment.

On mechanical equipment and motors in contact with sewage, sludge or other corrosive environments, fasteners shall be stainless steel grade 316.

All bolts and studs for gland joints, couplings joints and flanges shall be stainless steel grade 316 unless specified otherwise. Associated nuts and washers shall be stainless steel grade 304. Where high strength is required and approval is given by Principal's Authorised Person, high tensile bolts, nuts and washers may be used.

Unless otherwise noted, all pipe threads shall conform in dimension and limits of size to AS 1722 taper jointing thread.

All threads of stainless fasteners shall be coated with an approved nickel based anti-seize compound prior to assembly.

All fasteners, including chemical set, anchor bolts, threaded rods, nuts and washers that are embedded into concrete shall be manufactured in stainless steel grade 316. Zinc plated or black bolts and screws shall not be used.

On structural components, such as walkways and handrails, fasteners shall be stainless steel grade 316 excepting when structural components are hot-dipped galvanised, hot-dip galvanised fasteners shall be used.

On commercially supplied mechanical equipment, such as motors, gearboxes, pumps and conveyors, the Contractor shall replace any fasteners which are not of corrosion resistant materials with fasteners which comply with this specification.

The Contractor shall design and supply all anchor bolts, nuts and washers for the equipment supplied under this Contract. The anchor bolts, nuts, and washers shall be sized by the Contractor for the duty required. Chemical set or cast-in fasteners are permitted. Wherever possible, chemical set fasteners shall be used. Chemical anchors, when used, shall be installed in accordance with the manufacturer's directions.

Abandoned drill holes shall be thoroughly cleaned and filled with epoxy grout.

Where the relocation of masonry anchors necessitates alteration to steelwork base plates, the Contractor shall determine all additional stiffening or strengthening of the base plate and adjacent steelwork required.

14 SOCKETS

All socketed pipes shall be rubber ring jointed. Rubber rings shall comply with AS 1646.

In connecting pipes with rubber rings, the pipes shall be cleaned prior to connecting and care shall be taken to ensure that the rubber ring is maintained in a plane at right angles to the axis of the pipe. Each pipe shall be installed and connected as recommended by the manufacturer and each joint checked with a feeler gauge to ensure that the ring is in place. For pipes with skid type rubber ring joints, only the lubricant specified in writing by the manufacturer shall be applied in making that joint. The Contractor shall make the joint such that the witness mark, at no point, shall be more than one (1) mm from the end of the socket Should this either refer to AS and or Manufactures requirements

Ductile iron pipes shall be joint using either the standard “Tyton” rubber ring spigot and socket jointing system or the “Tyton-loc gasket” system.

15 GASKETS

Flange gaskets shall be in accordance with AS 4087.

Gaskets shall be manufactured from an elastomer (neoprene/fabric) complying with AS 1646 and may contain a reinforcement material. The minimum working pressure for gaskets shall be 1600 kPa at 3.0mm thick.

The gasket material shall be suitable for contact with the fluid being conveyed, the operating conditions and environment.

Pipes and fittings shall be in their correct position, alignment and grade before the joints are made and no springing of joints shall be permitted.

Pipe anchorages shall be provided to absorb static and dynamic thrusts from pipe fittings and valves.

16 FLANGES

Flanged joints connecting pipes, fittings, valves and pumps shall comply with AS 2129 (Flanges shall be Table E) or metallic flanges to AS 4087, Class PN16, as appropriate. Mating pipe flanges shall be drilled to suit the specified drilling of the adjoining valve or equipment.

Raised face flanges shall be mated with raised face flanges. Flat faced flanges shall be mated with flat face flanges.

Flanges on all steel, ductile iron, PVC, and GRP pipes shall be fully fixed flanges. Flanges on ABS and PE pipes may be stub flanges with loose metal backing rings or

full face up to 100 mm pipe diameter. On ABS and PE pipes of 100 mm diameter and larger, stub flanges with metal backing rings shall be used. Backing rings shall be manufactured from 316 or 316L stainless steel.

All bolts shall be stainless steel Grade 316 and all nuts and washers shall be stainless steel Grade 304.

Uniflanges shall only be used with prior written approval of Principal's Authorised Person.

Flanges for ductile iron pipes and fittings shall be integrally cast or fabricated and attached to the ductile iron pipe by screwing with mating threads filled with a suitable epoxy resin. Flange contact surfaces shall be raised face. Flange faces are to be coated with an approved soluble lacquer.

Flanges for spiral wound stainless steel pipe shall be of stainless steel.

17 PRESSURE GAUGES

Pressure gauges shall comply with the requirements of AS1349. Pressure gauges shall be industrial Bourdon Tube gauges with a glycerine filled diaphragm seal and shall be suitable for the service specified. Unless noted otherwise, gauges shall have a nominal diameter of 100mm and shall be fitted with a 10mm threaded shank.

The hydraulic oil type pressure gauges shall be used for process fluids that readily damage standard pressure indicators (i.e. the process fluid is in contact with a diaphragm that has hydraulic oil on the other side which transmits the pressure signal to the indicator).

18 BEARINGS AND LUBRICATION

All ball or roller bearings shall be rated in accordance with AS 2729.

Where lubrication is required the bearing housings shall be fitted with seals and shall be grease lubricated. Grease nipples shall be provided for all bearings. Where access is restricted, capillary tubing shall be run from the bearings and grouped and labelled at a convenient accessible location. Bearing housings shall be fitted with grease pressure relief devices to prevent overpressure.

The bearing re-lubrication interval shall be calculated from the bearing/grease manufacturers data.

Plain bearings shall have steel shafts running in bronze or self lubricating graphite impregnated bushes and shall have a loading, based on projected area. Materials other than steel and bronze may be accepted where the Contractor submits full details for approval of the Principal's Authorised Person

The Contractor shall furnish all mechanical equipment with the correct lubricants to prevent corrosion during storage and installation and for starting and commissioning the plant. Lubricants shall be as recommended by the relevant equipment manufacturer.

Plates indicating the type of oil or grease, quantity and change period shall be fixed to the equipment items adjacent to the oil or grease lubrication points. Plates shall be engraved stainless steel grade 316, fastened with stainless screw.

19 VIBRATION

All bearings on the shaft of each electric motor greater than 50 kW (or where drive is critical to performance other than submersible) shall be fitted with vibration pick-up mountings to allow measurement in accordance with AS2625. The vibration pick-up mountings shall be SPM Model 32000 (or similar depending on the length) as marketed by SKF and shall be suitable for use with portable hand held transducers complying with Australian Standards. The pick-up mountings shall be fitted with protective caps of PVC.

The pick-up mounting shall be readily accessible when the motor is installed on its platform and when the motor is running without having to remove guards, cowlings or other components.

The pick-up mountings shall be rigidly mounted as close as possible to the bearings. Where clearance holes are necessary for the long vibration pick-up mountings, they shall have a diameter of at least 2 mm greater than the outside diameter of the mounting. If sealing of the opening is required an elastic damping material such as soft rubber shall be used.

The equipment shall be tested for vibration in accordance with AS2625 under all operating conditions. As a minimum the test result shall achieve a "SATISFACTORY" standard.

20 MOTION DETECTORS

Conveyors and other items, where installed, shall be provided with proximity sensor type motion detectors or electronic shear pins on a driven element (e.g. conveyor screw element). The motion detector shall detect rotation or movement of the item and a suitable metal "target" shall be supplied and fitted to operate the motion detector. The motion detector contacts shall be wired to the control system to give an alarm and/or machine shutdown if the equipment is running but the motion detector indicates that the driven element is not rotating or moving.

21 GEARBOXES

Each gearbox shall be designed to operate continuously at maximum duty with a service factor that is based on the maximum operating torque and the most conservative load classification for the drive in accordance with the American Gear Manufacturers Association (AGMA). In addition, each gearbox shall be designed to withstand starting torques of up to 250% of the full load running torque of the driving motor.

The direction of rotation of the input and the output shafts shall be permanently marked on the housing. Removable gasketed inspection covers shall be provided to permit inspection of the gears without disassembly of the gear reducer. Lifting lugs shall be provided on the housing to facilitate safe lifting of the gearbox.

The gears and bearings shall be lubricated to manufacturers recommendation. Where grease lubricated bearings are fitted, seals shall be installed to retain the grease in the housing. Grease nipples and grease relief devices shall be fitted to housings containing grease-lubricated bearings. Where pressure lubrication is provided a pressure switch with shutdown and alarm outputs is required.

The unit shall be provided with sight glass or indicator to observe oil levels. All oil fill and drain lines shall be of sufficient size to permit efficient functioning and shall be located on the gear unit in a position, which is easily accessible from the floor. The

Contractor shall supply all oil and drain piping so that a container may be placed under the drain discharge.

The gearbox when mounted in final location shall have inspection covers orientated to allow unencumbered access for maintenance.

Refer to TWEED SHIRE COUNCIL Electrical specification EL01 for specific data labelling.

22 DRIVES AND COUPLINGS

Pumps and equipment shall be fitted with rigid or flexible couplings as recommended by manufacturer to suit application.

Care shall be taken in checking alignment of driving and driven shafts. The motor and driven equipment shall be in alignment from all aspects in accordance with manufacturer's requirements .

The whole assembly including pulleys and couplings should be balanced to eliminate vibration.

22.1 Vee belt, wedge belt and toothed belt drives

Vee-belt and wedge-belt drives shall comply with AS 2784. All drives shall be designed with a minimum service factor of 2 based on motor rated power. Belts shall be standard commercial items readily available locally and normally kept in stock. Pulleys and sprockets shall be either keyed or taper type locking bush onto the shaft.

The belt manufacturer's recommendations for installation and alignment shall be strictly adhered to when fitting belt drives.

22.2 Chain drives

Chains used for power transmission shall be standard roller chains comprising steel links and hardened steel pins and rollers. Chains shall comply with AS1532 and shall have a minimum pitch of 19 mm.

Sprockets shall be of steel with flame hardened teeth, with hardness not less than 360 Brinell.

Access covers for inspection and lubrication of the chains and sprockets shall be provided in an easily accessible location. Automatic lubrication feeds are to be provided in hard to access locations.

For special application such as flight and chain scrapers in sedimentation tanks proprietary plastic chains may be used subject to approval of the Principal's Authorised Person.

23 LIFTING EQUIPMENT

23.1 General

The Principal uses lifting devices mounted on motor vehicles. Designs shall allow for this method of lifting wherever practical and include adequate access for these vehicles. The Designer shall seek information on the Principal's lifting equipment through the Principal's Authorised Person. The proposed method of lifting each item of equipment shall be submitted for approval of the Principal's Authorised Person. The Contractor shall be responsible for verifying that the Principal's nominated lifting equipment is suitable for the lifting duties.

Lifting equipment, including cranes, hoists and winches, shall be shall be supplied and installed by the Contractor in accordance with AS1418 Set & AS2550.

Suitable lifting facilities by means including but not limited to monorails, davits, jib cranes and gantry cranes shall be provided to enable maintenance and removal of equipment without encumbrance.

All equipment of weight greater than 50 kg shall be provided with lifting lugs or eyebolts for lifting purpose.

Access roads and loading bays shall be provided for vehicular access for direct loading from the lifting equipment.

All Principal supplied lifting equipment used in the construction works shall be refurbished back to as new condition prior to handover.

23.2 Testing

Lifting equipment shall be designed, manufactured and installed to the best modern practice and in compliance to NSW Work Cover Authority.

In accordance with AS1418 it shall be the Manufacturer's responsibility to design and register the crane and hoist and appurtenances with the NSW WorkCover, and to obtain the necessary approval of the department. Copies of the relevant documentation shall be made available to the Principal's Authorised Person prior to acceptance.

Load certification and registration in accordance with NSW Government Legislation is to be provided by the Contractor prior to handover.

The installation shall be checked and tested under working conditions to the specified requirements in the presence of and to the satisfaction of the Principal's Authorised Person.

23.3 Davits

Each lifting davit shall include a pedestal, mast, boom, hoist, associated lifting cables, sheaves, hooks, handles and all fixings.

The reach, height and rotation of the boom shall be suitable for raising and lowering the equipment from its installed position to a platform or floor area where it can be readily inspected, serviced or transported to a loading bay. The rotation of davits shall not compromise the safe working area on the platform or floor area.

Hoists shall be supplied with a stainless steel Grade 316 wire rope of sufficient length and strength to enable complete removal of the equipment.

23.4 Hoists

All hooks shall be drop forged steel with swivelling thrust bearings and a safety catch.

All external parts of hoist trolleys and chains shall be hot-dip galvanised.

The hoist and equipment shall be suitable for continuous exposure to the weather and direct sunlight.

Hot-dipped galvanised steel chain buckets, or suitable robust plastic bucket, attached to the trolleys or hoists shall be installed to collect hoist chains. The buckets shall be self draining and not accumulate water.

True vertical lift shall be available from the hoist.

All brakes shall be fail-safe under power failures. The brake mechanisms shall be protected against rain and dust ingress where required.

Guards shall protect the rope block sheaves.

Steel wire rope shall be in accordance with Australian Standard AS3569 and shall be hot dipped galvanised.

The hoist shall be capable of being fully lowered such that hook invert is level with the floor.

Electric hoists shall be controlled remotely by a hand held control station. The station shall house all the required equipment and push buttons to provide the required two speed control in each direction. Electric hoists shall be rated at IP56 or better.

23.5 Monorails

This section gives minimum requirements for the design, supply, manufacture and installation of monorail beams complete with electric girder trolleys.

Beams shall be manufactured from structural section steel and be hot dipped galvanised after fabrication. Each beam shall have trolley stops on both sides at its ends bolted to the beam.

Monorail trolleys shall be approved by NSW WorkCover and be complete with certification for both monorail and support structure. The Contactor shall be responsible for the certification of existing structures that support new monorail lifting equipment. Similarly where existing structures are modified to carry monorail beams the Contractor shall be responsible for gaining the appropriate structural certifications to modifications done.

Hoist hand chains and geared drive trolley chains shall be suspended below the runway beam to 300 mm above the floor.

The monorail trolley bearings shall be designed to allow the load to be moved and positioned with an effort of no greater that 150N.

23.6 Overhead travelling cranes

This section covers the minimum requirements for the design, manufacture, supply, installation, testing and commissioning of electric overhead travelling crane.

The Group Classification of the Cranes shall be C1 to AS1418.1. The Group Classification of the Crane Mechanism shall be M2 to AS1418.1.

The crane shall have a capacity to lift the heaviest section of equipment to be housed in the the Building.

The crane shall have sufficient hoist travel to lift the equipment free of all possible obstructions and place it on a suitable truck in the loading area.

Hoisting, lowering, cross travel and longitudinal travel of the crane shall be electrically operated.

Limit switches shall be provided on the longitudinal travel and cross travel to limit the motion of the crane or hoist prior to hitting the end stops.

Provision shall be made for lubrication of all working parts and lubrication points shall be located such that they are readily accessible from the crane service platform.

Operational testing of the crane shall be carried out by the contractor, with the crane in service under mechanical operating conditions (running tests without loading) prior to the loading testing conducted by the contractor.

The crane shall be tested by the contractor, in accordance with WorkCover New South Wales. The test load shall be according to the code of practice (AS1418).

24 EQUIPMENT INSTALLATION & LAYOUT

24.1 General

Equipment shall be installed on suitably structurally designed concrete plinths having a minimum height of 100 mm. The concrete plinths shall be constructed on prepared foundations or dowelled into existing concrete.

Equipment shall be properly aligned to the prescribed centre lines and elevations, and set and adjusted on packers and shims.

Bases of equipment shall be designed or filled in with grout so as not to create pockets in which dirt and/or water could collect so that cleaning around the equipment can be easily carried out.

Packers shall be of sufficient size to sustain an effective load bearing area. They shall be of one piece thickness.

Shims shall be of the same size as the packer. The maximum thickness of shim shall be used to reduce the number of shims required at any one point to a maximum of three (3). If the total thickness required is more than 6 mm, the shims shall be replaced with a single machined plate. Shim material shall be suitable for loading conditions and prevent galvanic corrosion brass or stainless steel. Aluminium stock is not acceptable.

24.2 Operation and Maintenance

The works shall be designed for operation and maintenance personnel to carry out their routine tasks without the need to shut down process units. Equipment service points shall be readily accessible.

In particular the following shall be adhered to:

i) Equipment arrangement shall be designed to have ready accessibility for operation, maintenance and installation work.

ii) All indicators and instrumentation shall at be at easy to read locations.

iii) Pipe work and supports shall be arranged to allow convenient access for operation & maintenance of the equipment. There shall be quick and unobstructed exit for people working around equipment.

iv) All equipment should be accessible for operation from the normal operational position.

v) At least 1100mm clearance between major equipment shall be allowed for maintenance access.

vi) Equipment shall be conveniently located in order to ensure the safe removal and replacement. Removal of such equipment shall not inhibit the availability of other installed equipment.

The contractor shall provide for all of the above items for any proposed future equipment.

24.3 Equipment alignment

All mechanical equipment shall be set, levelled, aligned and inspected with precision tools (steel straight edge, dial indicator and graduated machinist levels).

Specifically, all direct driven equipment shall be aligned by the use of a dial test indicator or laser alignment. Both the driver and the driven shafts shall be rotated simultaneously to each of the four positions at 0°, 90°, 180° and 270° at which readings shall be taken. The maximum allowable out-of-alignment tolerance shall be 50μm (0.050mm) unless specified otherwise in individual equipment installation instructions. An alignment record sheet shall be completed for each coupling aligned. This alignment

procedure shall also conform to the equipment manufacturer's instructions. All alignments shall be inspected and approved by the relevant equipment supplier's accredited representative. Inspections by the equipment supplier shall be coordinated and documented by the Contractor.

24.4 Grouting

Grouting shall be provided under all mechanical equipment and supports when mounted on a concrete base or plinth.

Epoxy grout shall be an epoxy resin based product designed for free-flow grouting of gaps of widths from 20 mm to 50 mm. A suitable grout shall be Fosroc Conbextra EPL or alternative approved by the Principal's Authorised Person. The components shall be supplied from the manufacturer in the correct mix proportions designed for whole pack mixing so that reproducible flow and mechanical properties are assured.

Chemical grout shall be a non-shrink, premixed, prepacked, fine graded siliceous based or non-catalysed iron aggregate cementitious grout. The grout shall be free from gas producing agents, oxidising catalysts and inorganic accelerators, including chlorides. The addition of potable water only shall be sufficient to achieve fluid consistency as specified below. A suitable grout shall be Australian Master Builders Masterflow 870A or equivalent.

25 WALKWAYS, PLATFORMS, LADDERS AND RAILINGS

The Contractor shall provide access platforms, stairways and barriers to AS1657 for maintenance and operation. Access by Ladders shall not be used except by prior approval by Principal's Authorised Person.

Where required, standard stairways and walkways shall be installed that have a minimum clear width of 750 mm.

Guard railing, including knee rails and toe boards shall be provided around all open structures, elevated walkways and access platforms.

26 TESTING AND COMMISSIONING

26.1 General

When not specified otherwise, all sampling and testing shall be in accordance with the methods prescribed in the current Australian standards, as applicable to the class and nature of the article or materials considered.

The Contractor is required to supply the Principal's Authorised Person with the following:

- Authority to enter the Contractor's Works or any Works engaged on manufacture of contract plant in order to facilitate the inspection of equipment during and after manufacture.
- Facility for the witnessing of tests. As far as is practical at least two (2) weeks notice should be given to the Principal's Authorised Person for final testing and reasonable notice is to be given of any preliminary tests or testing of components.

The cost of all inspections and tests shall be borne by the Contractor. The Contractor must provide all necessary testing facilities and equipment.

Copies of all test records and test certificates carried out by the various manufacturers must be supplied to the Principal's Authorised Person.

Upon completion of installation of mechanical equipment and controls, an experienced, competent, and authorised representative of the manufacturer or supplier of each item of major equipment shall visit the site of work to perform the following tasks.

- To inspect, check, adjust if necessary, and approve the equipment installation.
- To start up and field-test the equipment for proper operation, efficiency, and capacity.
- To perform necessary field adjustments during the test period until the equipment installation and operation are satisfactory to the Principal's Authorised Person.
- To instruct the Principal's Authorised Person's personnel in the operation and maintenance of the equipment.

26.2 Sample Pre-Commissioning and Commissioning Checksheets

Sample Pre-Commissioning and Commissioning Checksheets are provided as Appendix A to this Specification. These are the minimum requirements for checksheets. The Contractor may use their own checksheets if the checksheets can be demonstrated to be equal to or better than those provided.

26.3 Definitions

Inspection is defined as inspections during the construction of equipment to be supplied. Inspections are to be carried out by the Contractor to ensure that the construction is in accordance with the specified and tendered requirements.

Testing is defined as tests by the Contractor prior to demonstration. Testing includes both works testing, at the manufacturer's facilities and site testing.

Inspection and Testing Program (ITP) is the Contract Program, which must include the times for inspection and testing, and lists all tests and test procedures.

Design Pressure is defined as the pressure at which the system is designed to operate under normal conditions.

Allowable Operating Pressure is defined as the allowable internal pressure, excluding surge that a component can safely withstand in service.

Maximum Allowable Operating Pressure is defined as the Maximum internal pressure, including surge, which a component can safely withstand in service.

26.4 Works Testing

Witnessed works testing is required for the flow measuring equipment and some of the mechanical equipments. The Principal's Authorised Person reserves the right not to witness the testing of any of this equipment.

Forward certified test reports and test certificates to the Principal's Authorised Person. Use a NATA accredited testing facility to carry out all flowmeters and other measuring instruments tests and calibration and provide test certificate for each item of instrumentation.

26.5 FACTORY INSPECTION AND TESTING

26.5.1 Factory Inspection

The following are specific milestones for witnessed inspection by the Contractor of specifically fabricated items:

- First Inspection - Metalwork finished.
- Second Inspection - Metalwork finished and painted.
- Third Inspection - Fully assembled equipment.
- Final Inspection.

Inspections, other than the final inspection, are intended to maintain construction standards.

The Contractor must supply a brief report on each inspection.

26.5.2 Factory Testing

Testing at the factory for materials and of major items of equipment supplied by the Contractor under this contract must be carried out on the following as a minimum:

- Pumps with motor sizes greater than 11 kW must be works tested at the supplier's factory in accordance with AS2417.2 (Pumps Hydraulic Performance Acceptance Test);
- All other mechanical equipment as nominated in the Tender Document.

26.5.3 Test Certificates

Following completion of all tests the Contractor must submit to the Principal's Authorised Person a full set of test certificates for each item of mechanical equipment.

27 NOISE

27.1 Noise levels

Unless specified otherwise in the Schedule, the overall A-weighted sound pressure power level from each complete unit of equipment (e.g. pump plus motor) shall not exceed 85 dB(A) at a distance of one metre from any point on the equipment.

In addition environmental noise shall be considered. The effect of the equipment on noise levels at the boundary of the site shall be included in an accessment of the appropriate noise levels to be used.

27.2 Acoustic enclosures

Noise levels shall be contained by appropriate equipment design and acoustic enclosures. Acoustic enclosures should be used only if other appropriate engineering measures are not practical.

Where required, acoustic enclosures shall form an integral part of the equipment, and shall not adversely affect the safety or function of the equipment.

Acoustic enclosures shall not impede the flow of cooling air when fully installed.

Acoustic enclosures shall be constructed in a way that they can be easily removed for maintenance purposes. Where possible they shall be wheeled across the floor. The enclosure shall have locks /latches when they are located over the equipment.

Normal operation should be possible without opening or removing the enclosure. Hinged access doors shall be provided for easy access for routine inspection and maintenance.

The material used shall not be vulnerable to the high temperature inside the enclosure.

27.3 Noise tests

Following installation, equipment acceptance noise tests shall be conducted on site for compliance and final acceptance. All equipment supplied that does not meet the requirements for noise limits during site testing shall be rectified. Equipment that does not meet the requirements for noise limits due to faulty installation shall be rectified. The rectified equipment shall be retested until the requirements are met.

28 LABELLING

Labels shall be fixed to all items of equipment for both custom build and proprietary items. Labels shall be 316 stainless steel plates and fixed by oval head stainless steel screws.

The label (or nameplate) shall be suitably engraved to provide information of a descriptive and technical nature relating to the item of equipment.

The information given on the label shall include but is not limited to typical data as listed below:

(i) Equipment number

(ii) Equipment type, e.g. Screw conveyor, Axial Flow Fan, Torque Flow Pump

(iii) Name of manufacturer

(iv) Model Number

(v) Serial Number

(vi) Rated Speed. If two speed, state both speeds. If variable speed, state upper and lower limits

(vii) Capacity, e.g. pumps - litres/sec, hoppers - m3

(viii) Rating in kW or as appropriate

(ix) Full Load Current

(x) Guaranteed Duty Point Head and Flow

All data to be in metric units

The information to be supplied depends on the equipment item. For example, for a gearbox provide the reduction ratio.

The labels shall be in addition to nameplates of other materials, should these be supplied as part of the equipment.

The label dimensions should be selected to be suitable for the information contained thereon.

The label shall be affixed to the specific item of equipment so that it may be conveniently read when in the installed position and should be attached to a principal component of the equipment item so that it is not misplaced or inadvertently discarded on a replacement part during an overhaul.

In no circumstances should the label cause a safety hazard. A second loose label is to be supplied to the Principal's Authorised Person.

29 OPERATION AND MAINTENANCE MANUALS

29.1 General

Operations and Maintenance Manuals shall be prepared and submitted in accordance with *TWEED SHIRE COUNCIL ELECTRICAL DESIGN SPECIFICATION EL18 – OPERATING AND MAINTENANCE MANUALS*

30 WORK AS EXECUTED DRAWINGS

The Supplier shall submit electronic versions of drawings in AutoCAD 2000 format, or a more recent version, of the equipment supplied. Drawings of proprietary equipment may be presented in *.pdf format. All construction drawings submitted after the award of the contract shall be in accordance with AS1100, AS1101, AS1102 and AS1104. The drawings shall clearly state in the title block the number and title of the Contract. The Supplier's drawings shall include the following as a minimum:

- General arrangement drawings
- Connection details
- Parts lists
- Motor details
- Special instructions

Draft versions of all documents shall be submitted for approval prior to issue of the final version. The final issue of all documents shall include all relevant "Work as Executed" and commissioning modifications and updates of all data. The Works will not be considered complete until the above requirements have been satisfactorily complied with.

Drawings are to be supplied in the following formats:

1. One full size copy on film; and
2. One A3 reduction paper; and
3. One copy on CD (Autocad, DXF and PDF formats). The drawings are to have the title block completed and signed.
4. One set in PDF Format (files to be no larger than 5Mb in size and if multiple files must contain a Table of Contents).

31 WARRANTIES

The Contractor shall obtain warranties as specified in the Contract and shall ensure that the Principal will have the benefit of the warranties. The Contractor shall ensure that the Principal will have the benefit of any warranties specified in the Contract that are obtained by subcontractors.

32 CRITICAL SPARE PARTS AND TOOLS

All special tools required to operate and maintain the equipment shall be supplied with the equipment. Special tools shall be regarded as the tools that cannot be procured "over the counter" at the local hardware store.

These special tools shall not be used for the erection of the Works and must be handed over in a completely new and unused condition prior to equipment commissioning.

The Contractor shall, at the time of tendering, nominate a recommended list of spare parts and stock levels (inclusive of description, part number, supplier details, price, minimum stock and reorder level).

The special tools must be labelled to know what they are for and certified for the specific use and meet relevant AS.

33 CONFORMANCE WITH REGULATING AUTHORITIES

The Contractor shall ensure that all equipment and plant installed is in accordance with Relevant Acts, Regulations, Australian Standards, Codes, and other requirements of Regulatory Authorities. The Contractor shall arrange all inspections by relevant statutory authorities where required. Modifications that may be required resulting from the inspections shall be carried out by the Contactor.

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APPENDIX A SAMPLE PRE-COMMISSIONING AND COMMISSIONING CHECKSHEETS

GENERAL

The attached Sample commissioning Checksheets are provided to show the level of information required under the Contract. The Contractors standard Checksheets may be used with the approval of the Principal's Authorised Person.

The Contractor shall test and/or inspect all materials, equipment, installation and workmanship to prove compliance with the Specification requirements. The submission to the Principal's Authorised Person of satisfactory test results constitutes a HOLD POINT. The approval of the Principal's Authorised Person is required prior to the release of the hold point. Tests and inspections shall comply with relevant Australian Standards.

Testing shall include pre-commissioning, field testing and performance testing of each part of the whole installation.

PRE-COMMISSIONING

Pre-commissioning is the preparation of plant or equipment so that it is in a safe and proper condition and ready for commissioning and operation. It includes all aspects of plant operation such as safety, electrical, mechanical and instrumentation.

The Contractor shall conduct pre-commissioning in a logical sequence in accordance with the programme prepared by the Contractor and approved by the Principal's Authorised Person.

The Contractor shall prepare pre-commissioning record sheets for each item of equipment to ensure results of tests are satisfactorily recorded and that all necessary checks or tests have been performed.

Specific requirements for pre-commissioning shall include, but are not limited to:

(a) Initial charges of lubricant in addition to any special lubricant requirements for initial flushing or treatment of the system or for "running in".

(b) Physical checks and tests such as completeness of assembly, rotational tests (including checking that the rotation of electrical motors is in the correct direction), alignment checks, balancing and vibration checks, temperature, pressure and flow measurements, clearances, belt alignment and tension, etc, depending on the type of equipment.

(c) Electrical and instrument installation tests, including motor insulation tests and checking instruments against certified instruments and correcting as necessary.

(d) Tests of the correct functioning of automatic and manual control and protection equipment, including simulating danger conditions, mal-operations or failures, to check that all instruments and controls function correctly. These tests shall also include adjusting instrument set points and alarm settings and proving correct operation of alarms.

(e) Equipment and system operating tests. The Contractor shall certify compliance of each item and submit a signed copy to the Principal's Authorised Person prior to commissioning.

The Contractor shall carry out pre-commissioning tests to the satisfaction of the Principal's Authorised Person's and shall record the results of the tests on the appropriate Pre-commissioning Record Sheet. The Contractor shall furnish the Principal's Authorised Person with one signed copy of each completed Pre-commissioning Record Sheet countersigned by the Principal's Authorised Person who witnessed the test.

PRE-COMMISSIONING AND TESTING CHECKSHEETS

TWEED SHIRE COUNCIL Date of Commissioning :	Job Name:	
	Job Number:	
Commissioning Checksheet **Document No:**	ITP Reference:	
Description :	Category :	

Mechanical Pre-Commissioning Checksheet			
DESCRIPTION:	**CIRCLE**	**CHECKED BY (SIGN AND DATE)**	**COMMENTS**
Check the installation of equipment & its associated instrument, ancillaries and fittings. Does it comply with Principal specifications e.g. Layouts, P&IDs ?	Y/N/NA		
Is equipment safety adequate? (guards for all rotating parts, ladders, platforms, handrails, kick plates, safety showers etc)	Y/N/NA		
Check all holding down bolts are fastened and tight	Y/N/NA		
Visually check alignment of connections of drive systems	Y/N/NA		
Is the oil / grease level adequate?	Y/N/NA		
Checking correct selection of construction material	Y/N/NA		
Check site corrosion protection and that painting is adequate.	Y/N/NA		
Can equipment be lifted clear of guide rails and steelwork where provided?	Y/N/NA		
Check that equipment labels and tag numbers are correct.	Y/N/NA		
Check that safety signs comply with specifications.	Y/N/NA		
Confirm that vendor Factory Testing Certificates or Type Test Certificates and perfomances curves have been obtained (attach copy of performance curve to this ITP)?	Y/N/NA		
Check motor shims such that vibration during operation will not cause movement or dislodge them?	Y/N/NA		
Confirm Motor frame and Terminal Boxes have been properly grounded?	Y/N/NA		

TWEED SHIRE COUNCIL Date of Commissioning :		Job Name: Job Number:	
Commissioning Checksheet **Document No:**		ITP Reference:	
Description :		Category :	
Mechanical Pre-Commissioning Checksheet			
All valves operate from the closed to fully open position	Y/N/NA		
All valves seal when closed	Y/N/NA		
All valves are easy to operate and have no sharp protrusions on Hand Wheels	Y/N/NA		
All fasteners and mountings are tightened correctly	Y/N/NA		
Pressure gauge cocks provided as required.	Y/N/NA		
Drop tube and baffle wall installed	Y/N/NA		
No rubbish at the bottom of the well or around the equipment which is likely to damage the equipment when it is started	Y/N/NA		
General Comments			
PRINCIPAL'S COMMISSIONING REPRESENTATIVE:	**Signed:**	**Date:**	
CONTRACTOR'S REPRESENTATIVE:	**Signed:**	**Date:**	
DEVELOPER'S REPRESENTATIVE:	**Signed:**	**Date:**	

COMMISSIONING

After successful completion of testing and pre-commissioning the commissioning stage must be carried out.

During commissioning stage the completed pump station will be operated automatically and manually.

The following must be proved during each pump station trials:

1. Each fixed speed pump operates at flow and head required under all operating conditions to achieve the Performance Requirements;
2. Each variable speed pump operates at flow and head required under all operating conditions over the entire range of operating speeds to achieve the Performance Requirements; and
3. The power consumption at each pump station does not exceed the guaranteed power consumption.

Commissioning is not complete until the pump station has been run continually without any faults for a minimum of fifteen (15) days in accordance with required control and operation procedures. If during this period any mechanical or electrical equipment does not operate as specified then the commissioning must be repeated after rectification of defects. All rectification works and the cost of additional commissioning will be to the Contractor's expense.

Manufacturers Compliance Certificates

Manufacturer's compliance certificates for supply of pipes, valves, pumps, flowmeters and electrical equipment shall be provided to the Principal's Commissioning Representative.

SAMPLE COMMISSIONING CHECKSHEETS

TWEED SHIRE COUNCIL			Job Name:		
			Job Number:		
Commissioning Check sheet **Document No:**			ITP Reference:		
Description :			Category :		
General Information					
Equipment Tag No.:			Serial No.:		
Equipment Location:			Weight:		kg
Hazardous Area Rating:			Design Flow:		m3/hr
Manufacturer			Design Head:		m
Pump Type:			Liquid Description:		
Rated Motor Power:		kW	Paint Specification:		
Pump Speed:		rpm	Casing Material:		
Pump Motor Data					
Motor Manufacturer			Motor Speed:		rpm
Model Number:			Speed if Fixed:		rpm
Serial No.:			Max Speed (VSD):		rpm
Full Load Current:		Amps	Min Speed (VSD):		rpm
Rated Volts:		V	Gearbox:		
Motor Weight:		kg	Ratio of gearing:		
IP rating:			Gearbox Weight:	-	kg
General Comments:					

TWEED SHIRE COUNCIL		Job Name:	
		Job Number:	
Commissioning Check sheet **Document No:**		ITP Reference:	
Description :		Category :	

Wet-Commissioning Checksheet

Description:	**Circle**	**Checked By (sign and Date)**	**Comments**
Have all pre-commissioning checks been signed of as per ITP.	Y/N/NA		
Have electrical pre-comm. Checksheets been completed or sign off	Y/N/NA		
Has manufacturer pre-comm. Checksheets been completed or sign off	Y/N/NA		
Check that adjustments and setting of no-flow, torque limit switches and thermal overload relays have been set.	Y/N/NA		
Test any associated field devices. Eg isolating switches and safety devices.	Y/N/NA		
Test pump for Field start / stop and emergency stop control.	Y/N/NA		
Uncouple motor and check direction of motor by jump-start. Is direction of rotation of pump correct?	Y/N/NA		
Test pump for Remote Manual start / stop control?	Y/N/NA		
Test pump for SCADA start / stop control?	Y/N/NA		
Check that the equipment Input / Output signals are consistent with the control system Feedback signals?	Y/N/NA		
Has Motor Been Re-coupled from direction test?	Y/N/NA		
Have all dry-commissioning checks been signed of as per ITP?	Y/N/NA		
Is there any leakage in the system?	Y/N/NA		
Do up stream and down stream pressure gauges read the same?	Y/N/NA		

General Comments:

TWEED SHIRE COUNCIL		Job Name:	
		Job Number:	
Commissioning Check sheet **Document No:**		ITP Reference:	
Description :		Category :	

Commissioning and Performance Testing			
Description:	**Circle**	**Checked By (sign and Date)**	**Comments**
Have all wet-commissioning checks been signed of as per ITP?	Y/N/NA		
Is there any leakage in the system?	Y/N/NA		
Complete attached Performance Test sheet as per commissioning procedure.	Y/N/NA		
Does equipment fulfil its designed function under Wet-commissioning? (Delivers design flowrates, current draw etc.)	Y/N/NA		
Is equipment deemed ready for Process Commissioning / demonstration? (eg can be operated under Remote Manual control for a process cycle without tripping alarms)	Y/N/NA		
General Comments:			

PRINCIPAL'S COMMISSIONING REPRESENTATIVE:	**Signed:**	**Date:**
CONTRACTOR'S REPRESENTATIVE:	**Signed:**	**Date:**
DEVELOPER'S REPRESENTATIVE:	**Signed:**	**Date:**