

Engineering Site Standard

GPC-MSS-107

Vibratory Feeders

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Brief description

This standard applies to the design, manufacture and assembly of vibratory feeders at Gladstone Ports Corporation's RG Tanna Coal Terminal.

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1. Scope

This standard applies to the design, manufacture and assembly of vibratory feeders for the Gladstone Ports Corporation's RG Tanna Coal Terminal, located in Gladstone, Queensland.

2. References

All work shall be in accordance with the relevant Australian Standards. In the absence of relevant Australian standard, the British or ISO Standards shall apply.

As a minimum, refer below for guidance on Australian Standards, Specifications and Codes that shall apply.

If there is a conflict for design requirements between relevant standards, specifications or codes, the most stringent requirements shall be adhered to.

2.1. Standards

AS 1081	Acoustics—Measurement of airborne noise emitted by rotating electrical machinery
AS 1065	Non-destructive testing – ultrasonic testing of carbon and low alloy steel forgings
AS 1111.1	ISO metric hexagon bolts and screws - Product Grade C - Bolts
AS 1112.1	ISO metric hexagon nuts – Product grade A and B Bolts
AS1170	Structural design actions
AS1252	High strength steel bolts with associated nuts and washers for structural engineering
AS 1275	Metric screw thread fasteners
AS 1319	Safety signs for the occupational environment
AS/NZS 1554	Structural steel welding
AS/NZS 1554.1	Structural steel welding: Welding of steel structures
AS/NZS 1554.4	Structural steel welding: Welding of high strength quenched and tempered steels
AS/NZS 1554.5	Structural steel welding: Welding of steel structures subject to high levels of fatigue loading
AS 1654.1	ISO system of limits and fits - Bases of tolerances, deviations and fits
AS 1654.2	ISO system of limits and fits - Tables of standard tolerance grades and limit deviations for holes and shafts

AS 1657	Fixed platforms, walkways, stairways and ladders - Design, construction and installation
AS 1755	Conveyors - Safety requirements
AS 1418	Cranes
AS 2758	Aggregates and rock for engineering purposes - Definitions and classification
AS 3774	Loads on bulk solids containers
AS 4024.1	Safety of machinery
AS 4324.1	Mobile equipment for continuous handling of bulk materials
AS 4100	Steel structures
AS 60034.9	Rotating electrical machines - Noise limits
AS 60974.1	Arc welding equipment - Welding power sources (IEC 60974-1:2000, MOD)
PD970	Wrought steels for mechanical and allied engineering purposes
ISO 1940-1	Mechanical vibration - Balance quality requirements for rotors in a constant (rigid) state - Part 1: Specification and verification of balance tolerances
BS 4235-1	Specification for metric keys and keyways. Parallel and taper keys

2.2. GPC Engineering Site Standards

GPC-CSS-101	Supply, Fabrication and Erection of Structural Steelwork
GPC-CSS-107	Protective Coatings
GPC-ESS-203	Electrical, Instrumentation and Control Preferred Equipment
GPC-ESS-402	LV Squirrel Cage Induction Motors
GPC-ESS-502	PLC Programming
GPC-ESS-503	SCADA Programming
GPC-ESS-504	Communications
GPC-ESS-508	Control Systems Tag Naming
GPC-ESS-510	Functional Safety Standard - Functional Safety Management Plan
GPC-GSS-004	Manufacturers Data Report (MDR)
GPC-GSS-006	Preparation of Operation & Maintenance Manuals
GPC-MSS-101	General Mechanical
GPC-MSS-109	Hydraulic Equipment
Dwg 100-00150	RGTCT Stockpile Dischargers and Feeders Site Layout

2.3. Queensland Codes Of Practice

Plant Code of Practice 2005

Noise Code of Practice 2004

2.4. Regulations And Acts

Queensland Workplace Health and Safety Act 2011

Queensland Workplace Health and Safety Regulation 2011

3. Definitions

Engineer	GPC Engineering Superintendent or nominated representative
GPC	Gladstone Ports Corporation or its nominated representative
RGTCT	RG Tanna Coal Terminal
RGTES RGT	Engineering Services
URS	User requirements specification

4. Service Conditions And Criteria

The vibratory feeders covered by this standard will be installed both indoors and outdoors. All assemblies will be subject to coal erosion, coal fines and coal dust build-ups. All assemblies will be subject to high pressure water wash down operations using recycled water. All assemblies will be exposed to a potentially salt laden atmosphere given the proximity of the RGTCT GPC site to a marine environment.

5. Design

All drawings, calculations, test reports and the like shall use units in accordance with AS 1000 and GPC Site Standards. All mechanical, structural, civil and electrical design calculations shall be provided for approval by the Engineer.

5.1. Design Parameters

Each of the stockpile discharger units shall be designed for the following:

- Nominal capacity 6000tph
- Surge capacity 6600tph
- Minimum capacity 1000tph
- Max Belt Speed 5.5m/s – Unless Approved Otherwise
- Troughing angle 45° – Unless Approved Otherwise

- Conveyor Belt ST1250 1800mm – Unless Approved Otherwise
- Edge Distance Including Skirting – ISO 5048
- Coal Min Density 700kg/m³
- Coal Max Density 900kg/m³
- Max Lump Size 75mm
- Nominal size 50mm (95%)
- Daily Max Temperature 40°C
- Daily Min Temperature 6°C

In addition to any data on the data sheets, the Supplier shall ensure that the equipment is also capable of handling the following:

- Either coking coal, steaming coal or PCI coal
- Dry or wet (saturated)
- Hard, dry, compacted coal
- High compressive strength, tenacious coal
- High shear strength, tenacious coal

GPC requires that coal may be blended using the reclaim system. As such the vibratory feeder shall be capable of controlled material flow rates to vary drawdown rates from each unit.

The reclaim rate for each vibratory feeder shall not vary by greater than +/- 0.5% of the reclaim set point.

5.2. Durability

All plant shall be designed for a 15-year mechanical design life unless noted otherwise in this standard. The 15-year design life shall be achieved under the following conditions:

Continuous operation (365 days per year, 24 hours per day) 98% availability. This shall exclude scheduled maintenance.

5.3. Fatigue

In addition to the requirements of this standard, all structural components, shafts and pins shall be designed for infinite fatigue life.

6. Technical Requirements

6.1. Vibratory Feeder

6.1.1. Spillage

Due to the corrosive nature of coal fines, vibratory feeders shall be designed to not hold spilt coal. Seals shall be used where applicable to prevent spillage during operation and blocked chute events and control dust.

Steelwork stiffeners shall have shedder plates installed to reduce coal build-up.

New equipment shall be sufficiently IP rated for high pressure water washdown and dusty environment.

6.1.2. Feed Gates

Feed gates shall have two main operating modes; normal operation and wet weather.

Normal operation shall allow the gate to be opened between 20-100% for flow control, maintaining clearance between gate and bed.

Wet weather operation shall allow full closure of the gate to stop water inflow. When in wet weather mode, there shall be an interlock that prevents feeder operation.

6.1.3. Grizzly Bars

Grizzly bars shall meet the following requirements unless approved by GPC Engineer;

- Drop height shall be a minimum of 300mm
- Grizzly bars shall have a typical opening of 285 x 244mm
- Grizzly bars shall have sufficient access for cleaning/ clearing of foreign material and changeout
- Grizzly bars shall be fabricated from Bisalloy 80, with a minimum thickness of 12mm

6.1.4. Drives

Drive arrangements shall be fit for purpose and sized such that they require no external or additional cooling. Drive arrangements will be subject to high pressure water washdown and a dusty environment, and shall be IP66 rated.

6.1.5. Springs

Springs shall meet design life requirements of the feeder and shall be fit for purpose.

6.1.6. Bearings

All bearings used shall be suitable for high vibration applications.

6.1.7. Wear Liners

The use of wear liners shall be considered as part of the design. The GPC Engineer shall be consulted during design and selection of wear liners. GPC typically use either Alumina Tiles or 6/4 D60 Duaplate.

6.2. Access Platforms and Walkways

The vibratory feeders shall be supplied with all necessary platforms, access ways, ladders and stairs to provide all round, safe access to all equipment.

6.3. Guarding

All equipment shall be supplied with guarding in accordance with AS 4024.

All guarding shall be painted in accordance with GPC Engineering Site Standard GPC-CSS-107 Protective Coatings and colour coded in accordance with the Australian Standards.

6.4. Control System

6.4.1. Control Equipment

Supply of control equipment shall be in accordance with the following standards:

- GPC-ESS-502 PLC Programming
- GPC-ESS-503 SCADA Programming
- GPC-ESS-504 Communications
- GPC-ESS-508 Control Systems Tag Naming
- GPC-ESS-510 Functional Safety Standard - Functional Safety Management Plan

6.5. Steelwork

All steelwork shall be in accordance with GPC Engineering Site Standard GPC-CSS-101 Supply, Fabrication and Erection of Steelwork.

6.6. Lifting Equipment

6.6.1. General Requirements

All major components and serviceable parts shall be designed with lifting lugs to facilitate installation and maintenance.

Suitable lifting points/ monorails shall be designed and installed to allow installation and removal of equipment.

As a minimum, all lifting points shall be:

- Designed in accordance with AS 4100
- Fit for purpose
- 100% NDT tested
- Certified by RPEQ engineer
- Clearly shown on RPEQ approved Installation Drawings showing all relevant data for safe lifting and installation. – i.e. WLL, sling angle and lifting arrangement.

6.6.2. Removable Guard railing

The Supplier shall incorporate removable guard railing in all locations where a lifted load may clash with the guarding if it were a fixed type.

Removable guarding shall be installed under drop zones for lifting points and within the path below monorail cranes.

All removable guard railing shall be in accordance with AS1657.

6.7. Physical Envelope

The arrangement of the vibrating feeders, flow control gates, platforms and access ways and all other associated equipment shall be designed to fit within the envelope specified on the Drawings.

6.8. Shafts And Pins

All shafts and pins shall be in accordance with GPC Engineering Site Standard GPC-MSS-101 General Mechanical.

Shafts and pins under 50 mm diameter shall be constructed of Grade 316 stainless steel, unless noted otherwise on the drawings or if structural/mechanical limitations of Grade 316 stainless steel make the material not fit for purpose. In the case that 316 S/S is not fit for purpose, the alternative material shall be approved by the GPC Engineer.

Shafts and pins shall be machined on all surfaces, and centre machining marks shall remain on shafts used in rotating machinery, provided that leaving the centre machining mark on the particular item does not structurally and mechanically weaken or decrease the durability of the item.

6.9. Lubrication

All lubrication systems shall comply with:

- GPC-MSS-109 Hydraulic Equipment
- GPC-MSS-104 Piping Systems

6.10. Bolted Fastener Requirements

All equipment shall be supplied with threads in accordance with the following requirements:

All threads shall be coarse pitch metric to AS 1275.

All fasteners shall be in accordance with the following standards where applicable:

- AS 1111
- AS 1112
- AS 1252

6.10.1. Proprietary Bolting

The GPC Engineer shall approve the use of proprietary fasteners incorporated in proprietary equipment when all bolting is in accordance with the fastener manufacturer's recommendations.

6.10.2. Vibration of Fasteners

All fasteners shall be supplied with self-locking nyloc or metal prevailing torque nuts that have been demonstrated by the Supplier to be effective in identical previous applications.

6.11. Welding

All welding shall comply with;

- The relevant section of AS 1554
- GPC-CSS-101 Supply, Fabrication & Erection of Structural Steel

All weld details shall be designed to prevent any weld fatigue due to vibration during the expected design life of 15 years for the equipment.

All welding shall be undertaken with consideration to the following:

- The Supplier shall be responsible for fits and tolerances of all equipment, therefore distortions of the finished product cause by heat from welding shall be prevented

6.12. Structural And Mechanical Tolerances

All items shall be fabricated in accordance tolerance limits given by the applicable Australian Standard or ISO or British Standard where an Australian Standard is not available.

6.13. Drive Couplings

Flexible and rigid couplings shall be selected to suit all steady and transient torque and speed loadings during normal operation, coal blockages, coal flooding, stopping and starting.

All couplings shall be supplied with guarding in accordance with this Standard.

All guarding and access for greasing points shall be in accordance with the special requirements of this Standard.

All drive couplings shall be compatible with abrasive coal dust and dry or damp coastal salt atmosphere.

6.14. Accessibility Of Plant For Periodic Maintenance And Inspection

All structural elements of plant are accessible for visual inspection and NDT testing without disassembly or removal of any plant.

6.15. Electrical Equipment

Supply of electrical equipment shall be in accordance with the following standards:

- GPC-ESS-203 Electrical, Instrumentation and Control Preferred Equipment
- GPC-ESS-402 LV Squirrel Cage Induction Motors

6.16. Equipment Manuals And Training

Refer to GPC-GSS-006 Preparation of Operation & Maintenance Manuals.

6.17. Packing And Transport

Refer to GPC-GSS-007 Packaging, Transport and Delivery of Goods for requirements.

7. Inspection and Testing

7.1. Inspection And Testing Plan (ITP)

The Inspection and Testing Plan shall be submitted to the Engineer for approval prior to all fabrication works. The ITP shall specify comprehensive testing requirements for all works, including but not limited to:

- Weld preparation
- Weld testing
- Weld repair
- Protection devices
- Coatings

7.2. Compliance Certificates

A certificate of compliance shall accompany each actuator, gate, profile finer, vibrator, chute, and protection system. This certificate shall state that the item complies with the requirements of this standard and indicate the Australian Standards to which they have been tested.

8. Documentation

At the completion of all work (design, risk assessment, fabrication, installation, testing and commissioning) Manufacturer's Data Report (MDR) shall be submitted to Gladstone Ports Corporation. The Manufacturer's Data Report shall comply with GPC Engineering Site Standard GPC-GSS-004 Manufacturers Data Report (MDR) and **is written evidence** that the work has been carried out in accordance with the requirements of the Australian Standards and this standard.

Operation and Maintenance manuals shall be provided to GPC prior to completion of project. The manuals shall be prepared in accordance with GPC Engineering Site Standard GPC-GSS-006 Preparation of Operation & Maintenance Manuals. The minimum information to be contained in the manuals shall be;

1. Description of equipment
2. Operation philosophy
3. Functional description
4. Safety and operating instructions
5. Maintenance procedures and settings
6. Service instructions
7. Parts list
8. Equipment installation and commissioning instructions