



Hunter Water Corporation A.B.N. 46 228 513 446  
Standard Technical Specification for:

**STS 405**  
**CONSTRUCTION OF WATER PUMP**  
**STATIONS**

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# Standard – Construction of Water Pump Stations – STS 405

## 1 Purpose

This technical specification describes Hunter Water's requirements for the construction of water pumping stations to ensure that designers and constructors produce consistent and high quality assets.

All materials and equipment must conform to the requirements of all current and applicable Australian Standards (AS) and the National Construction Code (NCC). The Contractor must refer any conflicts in the information to HWC for clarification.

This STS applies equally to:

- Projects delivered by Hunter Water
- Developer works where ownership is transferred to Hunter Water
- Construction of new pumping stations
- Augmentation, modification and maintenance work at existing pumping stations

This specification is intended for the following audience:

- Developers, planners and designers
- Project and contract managers
- Constructors and installers
- Hunter Water asset managers

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## 2 Interpretation

For the purposes of interpretation of this this Standard Technical Specification (STS), except where the context requires otherwise:

- 'Drawings' means the drawings detailing the work involved in a particular project in hand
- 'Include' means including but not limited to, and is used to provide clarification or examples of the type and nature of items intended
- 'Specification' means a specification detailing the work involved in a particular project
- 'Standards' means applicable industry standards include the Australian Standards (AS), Australian / New Zealand Standards (AS/NZS), American National Standards Institute (ANSI) and ISO Standards (ISO) referenced in Appendix A
- 'Standard Drawings' means Hunter Water Corporation Limited drawings
- 'Standard Technical Specification' (STS) references any of Hunter Water's Standard Technical Specifications, as implied by the text.
- Headings are for the convenience of the reader and shall not be used in the interpretation of this Standard Technical Specification.

Unless stated otherwise, any expression such as "give notice", "submit", "approval", or "directed" means give notice to, submit to, approval by, or directed by the person nominated by the Hunter Water.

Approval does not imply acceptance of responsibility by Hunter Water for compliance with this technical specification. Unless approval has been issued in writing, approval has not been granted.

Failure to comply with the requirements of this STS or any referred documentation may result in rejection. Where equipment and / or manufacture is rejected, notice will be given by Hunter Water in writing. All associated rectification work shall be completed by the contractor at their cost.

Hunter Water standard documents, drawings, design guides and approved equipment and material lists are published at <https://www.hunterwater.com.au/building-and-developing/drawings-plans-and-specifications>.

### 2.1 Order of Precedence

The order of precedence that must be used for all water pumping stations is:

- Legislative requirements
- Specific requirements within the project documentation
- Specific requirements identified within this STS
- General requirements found within other Hunter Water STS
- Australian Standards
- WSAA standards and specifications

### 2.2 Exception to this document

Any concession to any requirement in this standard technical specification is valid only when authorised in writing by the document Owner.

Project specific requirements, including those in project specifications or Drawings, take precedence over requirements in this document and do not need exception approval.

### 2.3 Referenced documents

In addition to *STS 405*, all work must comply with relevant current Australian Standard (AS), Australian/New Zealand Standard (AS/NZS) and Hunter Water reference documents, including:

- Workplace Health and Safety Regulations
- National Codes of Practice (For example, SafeWork Australia Codes of Practice)

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- SafeWork NSW Codes of Practice
- Hunter Water's Standard Technical Specifications
- Hunter Waters NPV template
- ISO 9001 Quality Management Systems

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### **3 Roles and Responsibilities**

#### **3.1 Document Owner**

The Document Owner of this Hunter Water Standard Technical Specification for Design and Construction of Water Pumping Stations is Hunter Water's Manager Mechanical Engineering.

#### **3.2 Responsibilities**

The nominated Document Approver must approve the issue of any updated version of STS 405 in writing.

Any concession to any requirement in STS 405 is valid only when approved in writing by the Document Owner or the relevant engineering discipline lead.

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## 4 Definitions

Where the following term, abbreviation or expression occurs in this Standard Technical Specification, it is defined as follows, unless the context implies otherwise:

**Table 1: Definitions**

Term / Abbreviation / Expression	Definition
Admixtures	Used to improve the behaviour of concrete under a variety of conditions and are of two main types: Chemical and Mineral
APAS	Australian Paint Approval Scheme
AS	Australian Standard
AS/NZS	Australian/New Zealand Standard
Asset	Physical assets supplied to Hunter Water, whether as an individual item or an integrated system, and associated infrastructure in a particular project
Drawings	Drawings detailing the work involved in a particular project.
Hunter Water	Hunter Water Corporation
LCC	Life cycle cost
Life cycle cost	All costs associated with equipment or asset ownership, include design, construction, maintenance, energy usage and disposal
LGA	Local Government Authority
OEM	Original Engineering Manufacturer
REF	Review of Environmental Factors as required by Hunter Water's Design Manual Section 5 – Water Pump Stations
RPZD	Reduced Pressure Zone Device
SCP	Standard Construction Practice
Standards	Applicable industry standards including Australian (AS), Australian and New Zealand (AS/NZS), International Standards Organisations (ISO) Standards, Hunter Water Standards, and WSAA Standards where identified.
Standard Drawings	Hunter Water Standard Drawings
STS	Standard Technical Specification
VSD	Variable Speed Drive
WSA02	WSA02-2014-3.1 Sewerage Code of Australia Hunter Water Edition Version 3.1
WSA03	WSA03-2011-3.1 Water Supply Code of Australia Hunter Water Edition Version 3.1
WSAA	Water Services Association of Australia
WSA PS	WSAA Product Specifications
WPS	Water Pump Station

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## 5 General Requirements

All design, construction, manufacture, installation and commissioning works must comply with relevant legislation, relevant recognised standards and codes of practice. The installation must meet the process requirements of each station, must be fit for purpose and safe for operation.

Water pump stations must be designed in accordance with Hunter Water's Design Manual Section 5 – Water Pump Stations. The works must be constructed in accordance with the approved design.

All works must be completed to high standard of quality in a professional, safe and timely manner by competent and qualified personnel.

Hunter Water recognises the following standards:

- AS and AS/NZS
- WSAA

Acceptance of any other standards will be subject to Hunter Water approval.

All materials and equipment used in the works must be new and undamaged unless approved by Hunter Water.

A list of reference standards is contained in Appendix A.

## 6 Materials and Equipment

The requirements for all materials and equipment must be identified in accordance with the order of precedence defined previously within this document.

Hunter Water's Standard Technical Specifications and the WSAA Product Specifications are available from Hunter Water's web site at:

[www.hunterwater.com.au](http://www.hunterwater.com.au)

This document endeavours to reference other STS that contain requirements that exceed the WSAA minimum. The omission of a reference does not indicate that there is not a requirement within another STS and the onus is on document users to identify all relevant requirements from Hunter Water suite of STS. Hunter Water must be consulted if a conflict or uncertainty is identified.

The design must determine trench and thrust restraints specifications tailored to specific designs, including embedment and trench fill requirements. These specifications must be grounded in sound engineering principles, informed by geotechnical investigations findings and aligned with appropriate trench supports systems for additional information refer to WSA standards and specifications.

### 6.1 Pipes and Fittings

All pipes and fittings must comply with STS 600, WSA03 and relevant WSAA Product Specifications (Hunter Water Version). WSAA Product Specifications (Hunter Water Version) can be found on the Hunter Water website.

#### 6.1.1 UPVC Pressure Pipes and Fittings

Do not use UPVC pressure pipes exceeding 6 months of age from the date of manufacture.

#### 6.1.2 Ductile Iron Pipes and Fittings

Ductile iron pipes and fittings must be Class PN35.

All Ductile Iron fittings used in UPVC pressure pipelines must be fusion bonded polyethylene coated internally and externally to relevant standards.

Pipes made of ductile iron must have polyethylene sleeving fitted. The polyethylene sleeving must be installed to comply with WSA PS 320. Do not allow the polyethylene to be exposed to ultra-violet light for more than seven (7) days.

Sleeving may be omitted for items which have a thermal bonded external coating complying with AS 4158.

#### 6.1.3 Stainless Steel Pipes

Supply stainless steel pipes manufactured in accordance with ASTM A312. All pipes to be grade 316L seamless or continuously welded, with SCH40 minimum thickness.

#### 6.1.4 Polyethylene Pipes and Fittings

Supply Polyethylene pipes and fittings manufactured in accordance with WSA PS 207 and WSA PS 208. Use pressure pipe and fittings of PE 80 Type B to the class nominated in the Drawings in sizes DN 63 and DN 110 only.

### 6.2 Joint Seals

Supply elastomeric seals manufactured in accordance with WSA Product Specifications.

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### 6.3 Geotextile Filter Fabric

Buried pipework must be wrapped in geotextile filter fabric complying with WSA PS 355.

Geotextile filter fabric must be approved inert material such as BIDIM A14, manufactured by Geofabric Australia Pty Limited.

### 6.4 Piling

All piles must be designed and constructed for loads as specified in the design based on tested geotechnical data and geotechnical advice. Materials must be selected to achieve design life requirements. All piles loading conditions, design life and durability conditions to comply with AS 2159.

#### 6.4.1 Timber Piles

Timber piles must be treated hardwood, strength design in accordance with AS 1720.1, and in accordance with WSA PS 356 Piles. Timber piles must comply with AS 2159. All piles should be CCA treated in accordance with AS 1604, to the required hazard class for its intended application.

#### 6.4.2 Steel Screw Piles

Design and installation of steel screw piles must comply with AS 2159. All steel components and welding must comply with AS 4100. The use of steel screw piles must be considered for acid sulphate soils, high chloride concentrations, high water tables, saline/marine exposure soils/water and soft soil environments.

#### 6.4.3 Concrete & Grout Piles

Concrete cast-in-place piles, bored piles, encased piles, precast piles, and Continuous Flight Auger (CFA) piles are some methods which can be adopted on site based on designer and geotechnical advice. All concrete piles must comply with AS 2159. All concrete and steel reinforcement in concrete piles must comply with AS 3600. Concrete piles must have a minimum exposure classification of "Moderate" and a minimum concrete strength  $f'c$  as 32MPa at 28 days.

Micropiles can be considered as an alternative under special circumstances where other forms of piling methods are not preferred due to restricted access, underground/overhead service congestion or nearby sensitive structures which could be affected due to the piling activities. Micropiles must be designed as per industry standard practice, based on geotechnical advice and AS 2159 guidelines.

### 6.5 Metalwork

All metalwork must comply with STS 600.

#### 6.5.1 Steelwork

Pump stands and baseplate, where applicable, must be hot dipped galvanised.

#### 6.5.2 Aluminium Components

Apply approved bitumastic tape wrapping system to surfaces of aluminium components in contact with concrete.

### 6.6 Handrails and Access Platforms

All handrails and access platforms must comply with STS 600

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## 6.7 FRP products

Fiber Reinforced Polymer/Plastic (FRP) products may be used as an alternative to metal products for access platform grating and stair treads. Handrails and stanchions must be metallic and must comply with STS 600. Ensure that the proposed products are highly resistant to high concentration acids and alkalis, resistant to temperatures above 50°C, highly UV stabilised and high slip resistance.

All FRP products proposed must have a design life of 20 years or more.. Provide product and durability data to Hunter Water to review and approve for the proposed usage of FRP. All fasteners, fixing clamps/clips and support structures (beams/joist etc.) used in conjunction to support FRP must be of corrosion resistant materials as per STS 600.

## 6.8 Fasteners

All fasteners must comply with STS 600.

Use washers under all nuts. In addition, use washers under bolt heads for connection to items with protective coatings.

Where dissimilar metals would otherwise be in contact, supply and install insulating washers and sleeves to all connections.

Coat all nuts and bolts, except grade 316 stainless steel, on all flanged joints with a petrolatum tape system (i.e. Denso or similar) as per manufacturers recommendations.

Apply "Loctite" nickel anti-seize thread lubricant or equivalent to all stainless steel fasteners prior to fitting nuts.

## 6.9 Valves

All valves must comply with STS 600 and the appropriate WSA Product Specification.

## 6.10 Flanges

All flanges must be flat faced with elastomeric gaskets in accordance with the requirements of STS 600.

All flange bolting must be selected in accordance with STS 600. All fasteners and flange hardware within pit type stations must be grade 316 stainless steel.

## 6.11 Asset and Equipment Number Labels

For electrical labelling requirements refer to STS 500.

For pump labelling, refer to Section 12.5 Pump Numbers.

## 6.12 Telemetry Hardware

All telemetry hardware must comply with STS 500 and STS 550.

## 6.13 Pumps

Pumps must:

- Be supplied to meet the requirements of the project documentation, Design Manual Section 5, STS 500 and STS 600
- Be selected from the Mechanical Approved Product List, available at [hunterwater.com.au](http://hunterwater.com.au)
- Meet the site-specific requirements at lowest life cycle cost.

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Each pump must include a stamped or embossed stainless steel nameplate attached to the pump casing using stainless steel drive screws.

Nameplate details must include manufacturer's name, pump type, size, serial number, order/contract number, speed, year of manufacture and pump casing test head.

The complete pump assembly must be painted in accordance with AS 2312 to meet the exposure classification at the installation location and a durability requirement of at least 15 years. The base frame must be hot dip galvanised to AS 4680 with a coating weight of 600 g/m<sup>2</sup>.

#### **6.14 Hold Down Bolts**

Hold down bolts and chemical anchors must comply with STS 600.

#### **6.15 Equipment Supplied by Others**

On new installations, the electrical contractor must apply to supply authority for a new NMI. The Contractor must provide to HWC superintendent details of the proposed connection including site address, NMI number, number of pumps and pump motor sizing along with the details of the electrician for supply of new metering.

Electricity meter:

- Obtain the electricity meter direct from the supply authority.

Lock Barrels:

- Hunter Water to supply (free issue) padlocks and lock barrels at the time of factory acceptance testing
- Notify Hunter Water a minimum of 15 working days prior to requiring the Gen6 electrical lock barrels
- The installation of Hunter Water locks is the responsibility of the Contractor.

## 7 Environmental Protection and Site Controls

### 7.1 Environmental Protection Measures

Implement and maintain environmental protection measures in accordance with an approved REF and STS 900.

Before disturbing the natural surface on site submit an Erosion and Sediment Control Plan in accordance with STS 900.

### 7.2 Vegetation Clearing

Vegetation clearing must be in accordance with an approved REF.

Do not destroy, remove or clear vegetation or surface improvements to an extent greater than necessary for the execution of works.

Obtain the approval of the council for the removal of any trees. Take any steps necessary to prevent damage to trees that are not to be removed.

Dispose of all rubbish and surplus material within 24 hours of clearing.

Stockpile topsoil must be kept and managed separate from other excavated material and re-use the topsoil to make good the surface after backfilling.

### 7.3 Work in Roadways

Obtain and comply with the requirements of the Local Council and the Roads and Traffic Authority whenever work is to be undertaken in a roadway.

### 7.4 Existing services

#### 7.4.1 Location of Services

Any details of services shown on the Drawings are must be taken as indicating all existing services or exact locations. Irrespective of any information on the Drawings, verify the exact location of all services which may be affected by construction activities. If services are located which are not shown on the Drawings or are not in the location shown on the Drawings, confirm with the relevant authority or owner. Provide notice as per their relevant notification period prior to commencement of any construction activity.

#### 7.4.2 Protection and Maintenance of Services

Protect and maintain existing services to the satisfaction of the relevant authority or owner. This may include arranging or performing relocation, temporary diversion or support of the service.

#### 7.4.3 Repair of Services

Services damaged during construction must be repaired to the satisfaction of the service owner.

If a Hunter Water owned service is damaged during construction immediately notify Hunter Water authority prior to repair, arrange or perform repair to the satisfaction of the controlling authority or owner. Obtain from the authority or owner, a certificate stating that the repair has been carried out to their satisfaction.

If the service is not under the control of an authority and the owner cannot be located within a reasonable time, report the damage, and arrange or perform repair to an approved standard. Do not backfill, cover up or make the repair inaccessible prior to obtaining approval.

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## 7.5 On-site Stockpiles

Only store sufficient materials on site as are necessary to allow timely and efficient progress of the work. Locate stockpiles of excavated or imported material where they cause no interference to the public, drainage routes or vehicular or pedestrian traffic. Clear lines of sight for drivers must not be obstructed. Do not stack materials against structures, fences, trees or other property improvements. Leave a clear path at least 600 mm wide between the edge of any excavation and the inner toe of any stockpile or spoil banks.

Stockpile sediment control must be managed in accordance with the REF and STS 900.

## 7.6 Restoration

This clause applies to the restoration of all surfaces, services and/or improvements disturbed, destroyed, removed or damaged during construction of the Works and during installation of temporary works. Improvements include trees and shrubs, mulched areas, gardens, paving, flagging, proprietary finished areas such as 'pebble crete', 'stencil crete' or similar, retaining walls, fences.

Restoration of surfaces must be as near as practicable to the pre-existing surface condition.

If open excavations are used in improved surfaces, keep the trench width to the minimum allowed. Saw cut neat straight lines at the outer limits of the excavation through bitumen, asphalt and concrete. Remove pavers, blocks or brick pavements by hand, clean them and set them aside for later replacement.

Topsoil for surface restoration recovered from the site must be stockpiled separately. Recovered topsoil must be placed over the areas where it was originally located when completing backfilling and restoration. Where there is a shortfall of recovered topsoil, use approved imported topsoil in accordance with STS 413.

Vegetation restoration including turf, grassing and new landscape planting must comply with STS 413 and the REF.

## 8 Excavation

Excavation must comply Designer Drawing specifications and with WSA03 part 2 Construction.

### 8.1 Pipework Trenches

Excavation must be limited to the minimum that allows efficient construction of the Works. Keep pipe trench widths within the maximum widths recommended by the pipe manufacturer.

Excavations must be vertical to at least 150 mm above the pipe.

Minimum cover must meet requirements of design specifications and must be satisfied following the completion of all works, including any future earthworks or contouring of surfaces to complete the development. It is strongly recommended that services are laid after surfaces are formed to finished levels so that there is certainty that cover requirements will be met.

### 8.2 Improved Surfaces

Where excavation is required under improved surfaces such as pavements, driveways, kerb and gutter, use tunnelling or boring where the surfaces cannot be satisfactorily reproduced and under existing concrete footway areas and concrete driveways. Backfilling must fully support the surface and any likely applied load.

If open excavations are used in improved surfaces, keep the excavation width to the minimum allowed. Saw cut neat straight lines at the outer limits of the excavation through bitumen, asphalt and concrete. Remove pavers, blocks or brick pavements by hand, clean them and set them aside for later replacement.

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### 8.3 Explosives (Blasting)

Explosives must not be used during excavation.

### 8.4 Support of Excavations

Adequately support all excavations as the work proceeds to meet the requirements relevant Standards and Acts and WHS regulations to ensure that adjacent structures and services are not subject to disturbance by the excavation support system.

When removing, raising or withdrawing supports, exercise every precaution necessary to prevent slips or falls and ensure that no damage, disturbance or displacement occurs to the installations. Backfill simultaneously with the raising or withdrawal of supports. Ensure that compaction of pipe embedment and backfill material occurs below such excavation support and against native ground.

When directed or specified, leave the excavation support system in place as permanent support. Cut off the support system at a depth below ground surface that will satisfy the structural requirements of the site.

### 8.5 Drainage and Dewatering

Keep all excavations free of water. Provide, maintain and operate intercepting works to prevent surface water from entering the excavations; and all equipment necessary for dewatering the excavations and keeping the Works free from water.

Lowering of the water table by well points or other external dewatering methods may only be used if no damage is likely to be caused to adjacent structures and services.

Ensure that all downstream works that are under construction, completed or in use are protected at all times against the effects of any drainage which is discharged or likely to be discharged from the work.

### 8.6 Extra Depth Excavation

If extra excavation is required to reach a firm foundation or if excavation has extended deeper than necessary to meet the requirements of this Standard Technical Specification, refill to the required level with an approved non-cohesive material complying with STS 101. Place and compact the material in accordance with clause 10.1.

Where material has been disturbed to a level deeper than necessary under this Standard Technical Specification, compact the disturbed material to density index not less than 70% for granular (non-cohesive) material or to dry density ratio not less than 95% for non-granular (cohesive) material. If satisfactory compaction of the disturbed material cannot be achieved, remove the material and refill to the required level with an approved non-cohesive material complying with STS 101. Place and compact the material in accordance with clause “Backfilling”.

### 8.7 Foundations and Foundation Stabilisation

The bottom of the excavated trench is required to provide a foundation suitable for the adopted construction method. Refer to WSA03 for “*Foundations and Foundation Stabilisation*”.

### 8.8 Surplus Excavated Material

Surplus material is the property of the owner of the excavation site.

Promptly remove and dispose of excavated material which is not required for reuse. Dispose of lawfully and in accordance with project requirements.

Refer to REF for any additional requirements.

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## **9 Pipe Bedding, Laying, Jointing and Backfilling**

Materials and construction of Pipe Bedding, Laying, Jointing and Backfilling must comply with WSA03.

### **9.1 Bedding Sand**

Supply bedding sand embedment material in accordance with Standard Technical Specification STS 101 and WSA03.

### **9.2 High Grade Compaction Sand**

Supply high grade compaction sand embedment material in accordance with Standard Technical Specification STS 101 and WSA03.

### **9.3 Installation of Puddle and Thrust Flanges**

Puddle and thrust flanges must be connected with a metal to metal epoxy. Prior to connection of puddle or thrust flanges, any surface coatings must be removed from the flanges and the pipe at the location of the connection. The epoxy coating must extend beyond the removed surface protection to ensure that no bare metal remains exposed.

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## 10 Backfilling

### 10.1 General

Place and compact backfill in even layers on either side of structures or pipelines to avoid differential loading.

Keep all dewatering systems operating during backfilling so that no fill material is placed or compacted under water.

Pipelines and structures must not be damaged or moved during placement and compaction of fill.

Place and compact pipe embedment in layers not greater than 150mm thick and trench fill in layers not greater than 300mm thick, except in roadways use layers not greater than 100mm thick. Compact to the degree noted in the Drawings and WSA specifications.

Compact fill material by manual or mechanical tampers. Compact non-granular fill at a moisture content within plus or minus 2% of optimum and granular fill at a moisture content within plus or minus 3% of optimum. Flooding of the fill is not permitted.

### 10.2 Select Fill

Excavated material may be used for select fill as per design specifications and REF and be free from organic matter and have a particle size no larger than 20 mm. The material must allow compaction as specified without causing damage to the pipeline. If material excavated during excavation does not comply, import approved noncohesive material.

### 10.3 Trench Fill

For trafficable areas use:

- cement stabilised trench fill for all existing roads; or
  - crushed rock dust in accordance with STS 101; or
  - crushed rock in accordance with Standard Technical Specification STS 102; or
- as directed by the relevant authority responsible for the trafficable area.

Where the trench is not subject to traffic loading use excavated material for fill in the trench fill zone provided it has a particle size no greater than 75 mm across the largest dimension, is free from organic matter and can be placed into a dense mass free of voids and cavities.

Fill containing boulders, large rocks, logs, stumps, tree lopping's, builders refuse, broken concrete and other like material is expressly forbidden.

For pipe embedment, trench fill and support details refer to WSA03 ( including HW 28 Commentary on WAT-1200 Series – Embedment, Trench Fill and Restraints)

### 10.4 Cement Stabilised Trench Fill

Cement stabilised trench fill must comprise a 14:1 sand : cement mix.

### 10.5 Compaction and Density Testing

The degree of compaction must be measured in accordance with;

- for cohesionless (granular) fill - the density index determined in accordance with AS 1289.E6.1-19 based on the field dry density determined in accordance with AS 1289.5.3.1 or AS 1289.E3.5 and the maximum and minimum dry densities in accordance with AS 1289.E5.1

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- for cohesive (non-granular) fill - the dry density ratio determined in accordance with AS 1289.5.4.1 based on the field dry density in accordance with AS 1289.5.3.1 and the maximum dry density in accordance with AS 1289.5.1.1.

Compaction testing must be performed by a NATA accredited body.

Refer to WSA03 for compaction testing requirements.

## 11 Concrete

All concrete supply and construction must comply with the relevant requirements of STS 404.

### 11.1 Cement

Cement must comply to AS 3972 and be one of the following:

- Type SR fly ash blended cement containing 20-30% “fine grade” fly ash to AS 3582.1, or
- Type SR blended cement, other than fly ash.

### 11.2 Concrete

Concrete must be in accordance and comply with STS 404 including WSA PS 357 or WSA PS 358, and AS 3600.

Additives that enhance the durability of the structure (e.g. self-healing concrete crystalline compound), shall be considered in the design of water retaining structures. Prior approval is required from Hunter Water. The Contractor is encouraged to provide sufficient evidence of the proposed additive product advantages; long-term product performance evidence and cost pricing for the project for review and approval.

Supply concrete from plant(s) with third party certified quality systems for the manufacture and supply of concrete.. Use only one of the following cements:

- Fly ash blended cement conforming to the requirements of Type SR to AS 3972 and containing 20% fly ash to AS 3582 Part 1, “fine grade” only, or
- Blended Cement, other than fly ash, conforming to the requirements of Type SR to AS 3972.

### 11.3 Concrete Reinforcing

Concrete reinforcing must comply with:

- STS 404
- WSA PS 367
- AS 3600.

Supply reinforcement which complies with AS 1302 Steel reinforcing bars for concrete, AS 1303 Steel reinforcing wire for concrete, and/or AS 1304 Welded wire reinforcing fabric for concrete.

### 11.4 Identification Certificate

Identification certificates are required as per STS 404.

Do not use concrete supplied without a completed Identification Certificate.

### 11.5 Expansion and Contraction Joints

#### 11.5.1 Kerbing

Weakened plane (contraction) joints must be 3 mm wide, clean cut and made vertically through the concrete at right angles to the direction of the work. Space joints at 3 m intervals with minor adjustments to avoid short closing lengths.

Form expansion joints adjacent to other structures. Expansion joints must be sealed with 15 mm wide preformed, self expanding cork joint sealer cut to the full profile of the kerb section. Remove tape from top of sealer at about the time of final set of the concrete.

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Joint arises abutting cork joint sealer shall not be tooled off.

### 11.5.2 Footpaths and Minor Paving

Joints must be straight, continuous and normal to the surface of the pavement.

Weakened plane joints shall be formed by making a 3 mm wide cut for at least one quarter of the depth of the paving. Arises shall be tooled to a suitable radius. Space joints at 2 metre intervals with minor adjustments to avoid short closing lengths.

Expansion joints shall be constructed for the full depth of the paving using 15 mm wide preformed self expanding cork joint sealer. They shall be provided wherever the paving abuts fixed structures, such as buildings and pits, transversely at maximum intervals of 15 m along path and at path intersections. Joint sealer shall be bonded to the first placed concrete using a suitable contact adhesive. Remove tape from top of sealer at about the time of final set of the concrete. Joint arises abutting cork joint sealer shall not be tooled off.

### 11.5.3 Accessways and other structures

All joints to the details shown on the Drawings.

### 11.6 Blockouts and Cored Holes

Unless blockouts or cored holes are shown on the Drawings all pipes and fittings shall be cast into the structure when the structure itself is poured. Where this is not possible submit details of blockouts or alternative methods for approval. Details should conform to details shown on Drawing SCP-901;

All pipes that are cast into the concrete shall be thoroughly cleaned to remove all traces of dust, grease, rust and paint prior to the placement of concrete to secure a tight bond with the concrete

Where cored holes or blockouts are to be grouted to hold pipework, bolts and other fittings, the cored holes or blockout shall be scabbled and treated with an epoxy compound, such as Hilti CA80 ,Epirez 133 or Epirez 633, strictly in accordance with the Manufacturer's instructions;

Openings shall be constructed so as to leave a minimum clearance as nominated in Drawing SCP-901 between finished concrete and the location of the item to be cast-in. Reinforcement shall be constructed continuously through openings as detailed on the reinforcement Drawings and shall be trimmed around the item to be cast-in at a maximum distance of 50 mm from the item;

After placing the pipe and fitting, the remaining void shall be carefully filled with epoxy mortar, such as Hilti CA80 or Epirez 633 mixed, using appropriate sand (either Epirez No 2 Quartzite Aggregate or Hilti CTS 99 Graded Sand), to the Manufacturer's written instructions, to produce a watertight joint. The epoxy mortar shall be retained by a form which shall be built up as filling proceeds;

### 11.7 Cast In Items

Where fixing bolts to be cast-in are positioned by means of a template they shall be supplied with a backing nut and a face nut for secure fixing of the bolt. The backing nut shall be cast into the concrete;

Aluminium or ferrous structural members built into brick or concrete shall have their contact surfaces first painted with two (2) coats of bituminous paint.

All anchor bolts and fastenings cast in concrete shall be Stainless Steel Grade 316 to AS 2837 and STS 600.

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## 11.8 Surface Finish

Surface finish to comply with STS 404.

## 11.9 Topping

Topping or benching to comply with STS 404.

Prior to placing topping concrete and the grout beneath the pump baseplate or pedestal, scabble the concrete surface and apply Hilti CA80 or Epirez 133 epoxy.

Remove any splatter or solids lodged in or upon the pump baseplate or pipework.

## 11.10 Concrete Repairs

Concrete repairs must comply with STS 404.

Repair air voids, bolt holes and honeycombing using an epoxy paste such as Hilti CA273 or equivalent product approved for use by Hunter Water.

For thin bed bonding use Hilti CA80, Epirez 133, or equivalent product approved for use by Hunter Water.

Bagging and cement mortar repairs must not be undertaken.

## 11.11 Testing

Testing must comply with STS 404.

Concrete sampling and testing must be completed, including transportation of cylinders.

A minimum of 2 cylinders must be taken for all concrete supplies over 1m<sup>3</sup>.

A slump test must be completed at the time that the cylinders are taken.

Sampling and testing must be in accordance with relevant Australian Standards, using NATA certified tests.

Minimum crushing strength and slump when tested in accordance with WSA PS 358.

## 11.12 Construction Tolerances

All concrete works must be constructed to meet the tolerances, including positional accuracy, specified in STS 404. The construction methodology must ensure that any partly or fully completed structures do not move outside of these tolerances due to hydrostatic pressures.

## 12 Mechanical Requirements

### 12.1 General

All mechanical works must be completed in accordance with STS 600.

### 12.2 Tapping points

Tapping points must be installed in accordance with the design. Refer to Design Manual Section 5 – Water Pump Stations.

### 12.3 Gauge Board

A gauge board must be installed as per design. Refer to Design Manual Section 5 – Water Pump Stations. The gauge board must:

- Provide flow indication and indication of suction and discharge pressures, and strainer differential pressure
- Be 1,000mm x 1000mm size and fabricated from grade 316 stainless steel with folded edges (max 10mm)
- Be fixed approximately 125mm from the wall using z-brackets and grade 316 stainless steel chemical anchors
- Include ball valve assemblies comprising 2/DN10 male BSP adaptors, DN10 mini ball valve, DN10 male-female BSP union
- Include all tubing fabricated from grade 316 stainless steel, with all joints comprising olive type or union fittings
- Include transducer assembly comprising DN10 male BSP tube adaptor, DN10 male-female union (BSP), pressure transducers that meet requirements of STS 500
- Include 100mm pressure gauges with a 0-1000kPa range and meet the requirements of STS 600.

### 12.4 Pump Installation

Each pump must be numbered. 'Pump 1' must be the lowest serial number with subsequent pumps assigned in serial number order.

The number one pump must be located closest to the electrical switchboard, or in the case where pumps are equidistant from the switchboard it must be the pump furthest to the right hand side of the pit when viewed from the switchboard location. The remaining pumps must be located in ascending order.

### 12.5 Pump Numbers

Each pump must be identified using a 100 mm high number cut from 2.5 mm thick marine grade C5251-H34 aluminium or grade 316 stainless steel. The numbers must be the pump and starter number i.e.. "1", "2", "3".

Pump numbers must be laid out and fixed using grade 316 stainless steel expanding metal sleeve masonry anchors to the nearest wall so that there is no uncertainty about pump identification.

The pump with the lowest serial number must be the No 1 pump and must be installed closest to the electrical switchboard.

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## 13 Electrical Requirements

### 13.1 General

All electrical works including but not limited to design, construction and equipment must be developed, implemented and selected in accordance with AS/NZS 3000, STS 500, STS 501, STS 510, STS 550, STS 904 and the approved products and manufacturers list.

The contractor is responsible for all aspects of electrical design, construction, manufacture, delivery to site, installation, commissioning and rectification of defects during defects liability period.

All electrical works must meet the process requirements of each station.

The minimum requirements but not limited to for all stations include:

- One switchboard completely fitted out with all switchgear, instruments and equipment in accordance with the detailed design requirements
- One station flow transmitter
- One differential strainer pressure switch
- One suction pressure transmitter
- One delivery pressure transmitter
- One suction pressure switch per pump
- One delivery pressure switch per pump
- One low flow temperature switch per pump
- One pit flooded level switch
- One sump pump (when assessed in accordance with drainage requirements).

### 13.2 Supply Authority Requirements

Make all necessary applications and submissions to the supply authority. Forward the customer copy of all forms to Hunter Water.

Arrange for each authority having jurisdiction to inspect and check the works as required.

### 13.3 Equipment Rating

Equipment ratings shown on schedules or drawings are estimates only. Confirm the actual equipment ratings of the supplied equipment including motor starters and cabling.

Where the rating exceeds the drawing values, the required ratings of equipment and cables must be confirmed prior to installation.

### 13.4 Manufacture, Supply and Install of Electrical Equipment

Electrical installation works must be performed according to STS 500.

### 13.5 PLC, Telemetry, SCADA and automation System

PLC, SCADA and telemetry systems must be installed and commissioned for the control and monitoring of the stations using:

- Drawings, Functional Specifications and Project Documentation
- STS 550 General Requirements for SCADA and Automation Systems
- STS 500 General Electrical Requirements.

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### **13.6 Instrumentation**

All instrumentation requirements must be designed and implemented in accordance with STS 500 and STS 550.

Fix the station differential pressure switch and the station suction and pressures transmitters to the gauge board on the wall of the pit and connect to the pressure tubing from the tapings provided in the suction and delivery pipework.

### **13.7 Cables and wiring**

All cables and wiring requirements must be designed and implemented in accordance with STS 500.

All consumer mains in public reserves must be installed underground.

Flexible cables attached to pumps must not be cut or shortened and be neatly coiled in the space beneath the switchboard.

All supports and fasteners used and installed in pits must be manufactured from grade 316 stainless steel or approved non-corrosive products.

### **13.8 Overhead reticulation**

Overhead reticulation requirements must be designed and implemented in accordance with STS 500.

### **13.9 Underground reticulation**

Underground reticulation requirements must be designed and implemented in accordance with STS 500.

The switchboard plinth must be joined to the pump pit by a series of HD-PVC conduits.

### **13.10 Conduits, fittings and joints**

Conduit requirements must be designed and implemented in accordance with STS 500.

Termination of conduits above finished concrete level must be a minimum of 100mm high.

## 14 Access Road and Hardstand Areas

### 14.1 General

The road pavement to be designed by a civil or road engineer based on the site's soil conditions and location. A geotechnical assessment is required to confirm the subgrade and basecourse design. All roads to be designed in accordance Austroads Design Reference Documents.

### 14.2 Generator laydown

All sites must have a concrete laydown area for a generator. Generator laydown requirements for all sites must be developed and implemented in accordance with STS 500, STS 510 and Hunter Water during design.

## 15 Retaining Walls

### 15.1 General

Retaining walls above 600mm in height must be designed by a structural engineer and constructed according to the Drawings and WSA specifications.

Retaining walls up to 600mm tall must be concrete sleeper or block wall, installed in accordance with the manufacturer's guidelines.

Pipes passing beneath a retaining wall must be encased in concrete.

Retaining wall foundations must be approved prior to wall construction.

### 15.2 Retaining Wall Foundations

Retaining walls supporting earth backfills shall be designed to AS 4678.

Retaining walls up to 600mm tall from natural ground level must:

- Have vegetation, loose rock, soil, clay and friable weathered rock removed
- Irregularities filled with 20MPa minimum mass concrete and levelled appropriately
- Be founded on intact bedrock and not on a foundation of floaters
- Have the base of the wall a minimum depth of 250 mm below the finished surface level at the toe of the wall
- Do not support a retaining wall on undercut material.

Retaining walls up to 600mm tall founded on soil must:

- Have organic material stripped away
- Be scarified to a minimum depth of 200 mm, brought to the:
  - Standard Optimum Moisture Content according to AS 1289.5.1.1
  - compacted to a minimum dry density ratio of 95%, according to AS 1289.5.4.1
- Have fill placed in layers with a maximum loose thickness of 250 mm prior to compaction.
- Have the base of the wall at a level which is a minimum depth of 450 mm below the finished surface level at the toe of the wall.

### 15.3 Retaining Wall Backfill

Retaining walls up to 600mm tall backfill must:

- Be granular, draining material consisting of sand, crushed rock, slag, skulls, or ripped sandstone
- Not use clay material as fill material backfill material within 500 mm of the rear of the wall
- Minimise compaction of fill placed behind the wall to minimise the induced lateral stress against the wall
- Place fill in layers with:
  - a maximum loose thickness of 250 mm prior to compaction
    - compact to a dry density ratio as per AS 1289.5.4.1
    - of not less than 95% Standard Compaction as per AS 1289.5.1.1

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## 15.4 Drainage

Retaining walls up to 600mm height drainage must include a minimum 100mm diameter subsoil drain.

Retaining walls above 600mm height must include a minimum of 160mm diameter drainage with filter sock at the rear of the wall foundation. Drainage must follow the Drawings.

Provide a minimum of 1% fall in the subsoil drain line, falling towards, and connected to the nearest stormwater outlet or natural creek.

The granular backfill adopted shall be a minimum of 10mm no-fines drainage aggregate with a minimum base width of 150mm for 100mm Ag pipes and a minimum of 250mm base width for 160mm Ag pipe. The drainage aggregate shall stop no less than 200mm below the top of backfill earth, behind the retaining wall. Measures shall be taken to prevent the flow of fines mixing in with the drainage aggregate by using geotechnical drainage fabrics or alike.

Surface stormwater runoff must be directed:

- away from the back of the wall to prevent infiltration of surface runoff into the granular backfill
- to prevent erosion and possible undercutting along the toe of the wall
- to prevent erosion on the backfill earth behind the wall.

Water must not pond at the toe of the finished wall.

## 15.5 Handrail

Retaining walls higher than 600mm require a handrail and must comply with AS 1647 and STS 600.

## 16 Final Connection, Test and Commissioning

### 16.1 Connection To Existing Watermains

Applications for connection to Hunter Water's water network must be lodged using the Property Self Services Portal on Hunter Water's web site:

[www.hunterwater.com.au](http://www.hunterwater.com.au)

Only undertake connection to existing live watermains on completion of all other Works. Give written notice, including full details of the proposed connection procedures, 21 working days prior to making the connection and comply with any directions regarding the method and timing of the connection which are necessary to meet operational needs of the existing water supply system.

Perform the connection on the approved date and at the approved time. Do not commence the connection work unless all necessary materials and equipment are available on site. Undertake all work so as to minimise interruption to the operation of the existing water supply system.

Arrange for Hunter Water to shutdown the existing watermains to allow connection. Shutdown of Hunter Water's existing mains may not completely prevent the inflow of water into the sections isolated.

### 16.2 Acceptance Testing

#### 16.2.1 General

WPS piping is connecting to the water main therefore all station piping must be cleaned, flushed and disinfected as per the water main requirements of STS 408 Water Quality Acceptance Testing.

Undertake acceptance testing of the pump station pit and all pipelines constructed and in the following order:

1. Visual inspection.
2. Compaction testing (open trench construction only).
3. *Hydrostatic pressure testing*.
4. Water quality testing.
5. Special testing such as insulated *joint* resistance testing and specified trenchless construction testing.

Acceptance testing may be done progressively, but must be no earlier than 7 days after completion of the structure or pipeline section to be tested.

Give 48 hours' notice before commencement of acceptance testing. Ensure that structures and pipes are clean before any test is performed. Do not pressure test during wet weather.

If any of the tests prove to be unsatisfactory, detect and repair the fault and then re-test. Continue to repair and re-test until a satisfactory test is obtained. Even if testing produces satisfactory test results, repair any structure, pipeline or conduit in which there is a visible or detectable leak or blockage.

#### 16.2.2 Pump Testing

Factory Acceptance Testing of pumps must comply with STS 600.

#### 16.2.3 Pressure Testing of Pipelines

Test all pressure pipelines including all station pipework from the connection to the suction main (station inlet side) to the connection to the pressure main (station discharge side) in accordance with Section 19.4 of WSA03.

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#### **16.2.4 Automation and Telemetry Commissioning**

The equipment supplier must provide a commissioning test plan as per STS 550. This plan must be approved by Hunter Water prior to the installation of the equipment.

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## 17 Quality Assurance

All pre-commissioning, commissioning and documentation requirements must be completed in accordance with STS 500.

### 17.1 Pre-commissioning

Hunter Water must be provided with at least ten business days' notice prior to pre-commissioning.

The contractor must inspect, test, troubleshoot the WPS, and resolve all defects before scheduling pre-commissioning with Hunter Water.

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.

Pre-commissioning must be conducted in a logical sequence in accordance with Appendix B: Pre Commissioning Checklist.

Pre-commissioning tests must be carried out under the supervision and to the satisfaction of Hunter Water and must be recorded on the appropriate pre-commissioning checklist.

Prior to commissioning, submit one signed copy of each completed pre-commissioning checklist countersigned by the Hunter Water representative who witnessed the pre-commissioning test.

### 17.2 Commissioning

Commissioning is the running of the plant and equipment to ensure flow through the pumping system, carrying out any necessary testing and adjustments until it is ready and suitable for normal starting and running under service conditions. Commissioning is the final inspection stage of the construction works.

Representatives of Hunter Water must participate in the tests and may elect to record an independent set of test results for evaluation. Hunter Water require a period of ten business days' notice to undertake testing.

Commissioning must be conducted in a logical sequence in accordance with Appendix C: Commissioning Checklist.

Throughout commissioning the Contractor must:

- Be responsible for the test program.
- Provide continuous supervision by personnel experienced in the operation of the equipment and have qualified personnel in attendance to carry out all necessary adjustments and/or remedial work during the commissioning tests.
- Submit one copy of each completed commissioning checklist signed by the Contractor and the Hunter Water witness.

### 17.3 Testing and Commissioning Documentation

Once all commissioning and defect tasks are complete, the contractor must prepare and submit a completed commissioning plan to Hunter Water in accordance with STS 500.

Provision of completed commissioning checklists is a prerequisite of practical completion.

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## 18 Documentation

### 18.1 Tender Information

#### 18.1.1 Motor Protection

Tenderers must state in their tender those protective devices that must be operated as a condition of the warranty.

When specifying these protection devices, tenderers must fully describe any items that must be included in the switchgear for the satisfactory operation of the protective devices, together with the cost of the switchgear items.

#### 18.1.2 Pump station Arrangement

Tenderers are required to submit details of any necessary alterations to the wet well arrangements shown on the drawing(s) required to ensure satisfactory hydraulic performance of the pumps tendered.

Acceptance of the tendered pumps is conditional that they are suitable to the well arrangement as detailed unless alterations have been noted by the Contractor and accepted with the tenderer.

#### 18.1.3 Pump Drawings, Documents and Manuals

- Provide completed technical information as listed in STS 600
- Supply pump and accessory installation drawings for each pump station to the Contractor with a copy to Hunter Water for review.

### 18.2 Work-As-Constructed Documents

At least ten business days prior to the date of commissioning, provide work as constructed information in accordance with:

- *STS 903 WAC Information*
- *STS 904 Preparation of Electrical Engineering Drawings, and*
- *STS 906 Operation and Maintenance Manual Requirements.*
- *STS 911 Preparation of Civil and Structural Engineering Drawings*

Regardless of any WAC Information being submitted previously for any purpose, all WAC information must be submitted four weeks prior to practical completion in electronic data transfer. Transfer method to be confirmed with the Hunter Water Developer Services representative.

Electronic data is to include both pdf and native file formats (i.e. .dwg).

Hunter Water may provide comments within three weeks of the submission. Amendments must be made based on these comments and final electronic copies must be submitted.

#### 18.2.1 Operation and Maintenance Information

Prepare the Operation and Maintenance Manual in accordance with *STS 906 Operation and Maintenance Manual Requirements*.

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## 19 Related Documents

All work must comply with relevant current standards and regulations inclusive of all amendments. In particular:

- Workplace Health and Safety Regulations
- SafeWork NSW Codes of Practice
- SafeWork Australia Model Codes of Practice
- Hunter Water's Design Manuals
- Hunter Water's Standard Technical Specifications
- Hunter Water's Standard Drawings

Appendix A: Australian Standards, WSAA Standards, International Standards is a list of the standards referenced in this specification. Other standards are referenced within STS405.

## 20 Document Control

**Document Owner:** Manager Mechanical Engineering

**Document Approver:** Executive Manager Customer Delivery

Date	Clause	Amendment
March 2026	All	Complete document review and update. Document layout changed to improve clarity and readability. All clause numberings updated to reflect.
December 2005	2 22 23 23.2 28.1	Drawings SCP 920 to 922 deleted Requirements replaced with reference to STS903 Clause only to apply when information package not provided New format for Operation and Maintenance information Replaced with reference to Approved Products and Manufacturers on web site
October 2005	28.2.3	Address updated
August 2005	2.2 4.2 23 24.4 27.1 27.1 28.2.3 App C App D App E App F App G	Drawings SCP 920 to 922 deleted Reference to internet site added in lieu of appendices Requirement for submission before commissioning added Reference to appendices deleted Reference to internet site added in lieu of drawings Reference to internet site added in lieu of drawings Address updated Appendix deleted Appendix deleted Appendix deleted Appendix re-numbered Appendix re-numbered
August 2004	25.4.1 25.11.1	Addition of requirements for degree of protection for switchboards Deletion of personal protection requirements
November 2002	All	First version released of STS 405

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## Appendix A: Australian Standards, WSAA Standards, International Standards

Standard	Name
AS/NZS 1214	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
AS 1289.5.1.1	Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using standard compactive effort
AS 1289.5.3.1	Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of the field density of a soil - Sand replacement method using a sand-cone pouring apparatus
AS 1289.5.3.5	Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of the field dry density of a soil - Water replacement method
AS 1289.5.4.1	Methods of testing soils for engineering purposes - Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio
AS 1289.5.5.1	Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of the minimum and maximum dry density of a cohesionless material
AS 1289.5.6.1	Methods of testing soils for engineering purposes – Soil compaction and density tests – Compaction control test – Density index method for a cohesionless material
AS 1444	Wrought Alloy steels – Standard, hardenability (H) series and hardened and tempered to designated mechanical properties
AS 1604.1	Specification for preservative treatment – Sawn and round timber
AS 1627.0	Metal finishing – Preparation and pretreatment of surfaces – Method selection guide
AS 1627.1	Metal finishing – Preparation and pretreatment of surfaces – Removal of oil, grease and related contamination
AS 1627.2	Metal finishing – Preparation and pretreatment of surfaces – Power Tool Cleaning
AS 1627.4	Metal finishing – Preparation and pretreatment of surfaces – Abrasive blast cleaning of steel
AS 1627.5	Metal finishing – Preparation and pretreatment of surfaces – Pickling
AS ISO 9906	Rotodynamic pumps - Hydraulic performance acceptance tests - Grades 1 and 2
AS/NZS 3582.1	Supplementary cementitious materials - Fly ash
AS 3681	Application of polyethylene sleeving for ductile iron piping
AS 3972	General purpose and blended cements
AS 4100	Steel Structures
AS 60034.1	Rotating electrical machines - Rating and performance (IEC 60034-1, Ed. 11(2004) MOD
AS 60034.12	Rotating electrical machines - Starting performance of single-speed three-phase cage induction motors
AS 60529	Degrees of protection provided by enclosures (IP Code)
AS/NZS 1664.1	Aluminium structures – Limit state design
AS/NZS 1664.2	Aluminium structures – Allowable stress design

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AS/NZS 1665	Welding of aluminium structures
AS/NZS 2845.1	Water supply – Backflow Prevention Devices – materials, design and performance requirements
AS/NZS 3000	Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS/NZS 3008.1.1	Electrical installations – Selection of Cables – Cables for alternating voltages up to and including 0.6/1kV – Typical Australian installation conditions.
AS/NZS 3500.1	Plumbing and Drainage - Water Services
AS/NZS 3678	Structural steel, Hot-rolled plates, floorplates and slabs
AS/NZS 3679.1	Structural steel – hot rolled bars and sections
AS/NZS 3679.2	Structural steel – Welded I sections
AS/NZS 4087	Metallic flanges for waterworks purposes
AS/NZS 4534	Zinc and zinc/aluminium-alloy coatings on steel wire
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles (Reconfirmed 2017)
AS/NZS 4792	Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or specialized process
AS/NZS ISO 9001	Quality management systems — Requirements

**Table 2: APAS Codes**

Code	Name
2975	Ultra High build epoxy 2-pack coating for the long term protection of steel in atmosphere;
2975F	– Ultra High build epoxy 2-pack coating for the long term protection of steel; fresh water immersion
2975P	Ultra High build epoxy 2-pack coating for the long term protection of steel; potable water immersion
2975S	Ultra High build epoxy 2-pack coating for the long term protection of steel; salt water immersion

**Table 3: WSAA Product Specifications**

Number	Name
WSA PS – 211	Polyvinylchloride, Unplasticised (PVC-U) Pressure Pipes for Pressure Applications – Water Supply and Sewerage
WSA PS – 212	Ductile Iron Fittings (CIOD) for Plastic Pressure Pipe for Pressure and Non Pressure Applications – Water Supply and Sewerage
WSA PS – 214	Property Service Pipe – Water Supply - Copper
WSA PS – 215	Property Service Pipe – Water Supply - Polyethylene
WSA PS – 216	Polyethylene (PE) Fabricated Fittings for Pressure Applications - Water Supply and Sewerage
WSA PS – 263	Butterfly Valves for Pressure Applications – Water Supply
WSA PS – 264	Non-Return (Reflux) Valves for Pressure Applications – Water Supply and Sewerage

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WSA PS – 265	Air Valves for Pressure Applications - Water Supply
WSA PS – 266	Knife Gate Valves for Water Supply and Sewerage
WSA PS – 320	Sleeving, Polyethylene (PE) for Ductile Iron Pipe and Fittings. – Water Supply and Sewerage
WSA PS – 355	Geotextile Filter Fabric
WSA PS – 356	Piles
WSA PS – 357	Concrete, Pre Mixed, Normal Class
WSA PS – 358	Concrete, Pre mixed, Special Class
WSA PS – 363	Trench Fill Materials
WSA PS – 365	Recycled Materials for Trench Fill
WSA PS – 367	Steel Reinforcing Materials for Concrete

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## Appendix B: Pre Commissioning Checklist

To achieve completion of the design review phase, the checklist items listed below must be checked, as a minimum, to progress with the acceptance of the design. If certain checklist items are not able to be checked off as 'YES', a comment must be provided by the reviewer as to why. All checklist items not accepted by the reviewer must be translated to the review comments section in the Working Paper, distributed by the Project Manager.

For electrical pre-commissioning checklist contact Hunter Water.

The civil and mechanical pre-commissioning Checklist at the time of publish for this standard is available on the next page. Contact Hunter Water to receive the most recent version of the checklist.

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**Civil + Mechanical Pre Commissioning Checklist****WPS CIVIL + MECHANICAL PRE COMMISSIONING CHECKLIST**

<b>Project Name:</b>	<b>Project No:</b>
<b>Contractor:</b>	<b>Project Manager:</b>
<b>Witnessed By:</b>	<b>Trim reference:</b>
<b>Date:</b>	<b>Signature:</b>

**GENERAL**

	Item	OK	Comments
1	Confirm all buried valves are fitted with extension spindles (where distance from surface to spindle caps exceeds 350mm)	<input type="checkbox"/>	
2	Confirm flowmeter fitted, with provision to be able to remove, and operating satisfactorily	<input type="checkbox"/>	
3	Confirm strainer is fitted to suction pipework of station and air valve present and operational.	<input type="checkbox"/>	
4	Tapping points provided on both suction and delivery pipework adjacent pumps	<input type="checkbox"/>	
5	Confirm temperature probes and recirculation/pilot lines are fitted with union ends, isolation ball valves and operating satisfactorily	<input type="checkbox"/>	
6	Confirm presence of all pressure transmitters within pump pit/area are fitted and operating satisfactorily	<input type="checkbox"/>	
7	All pipework within the pump pit/area completed, and suitably anchored (SS where applicable).	<input type="checkbox"/>	
8	Check all pit cover branded HWC	<input type="checkbox"/>	
9	Check isolation valves fitted to pump suction side and delivery side of pump downstream of reflux.	<input type="checkbox"/>	
10	Specified pump number labels (Pump 1, Pump 2 etc.) are suitably sized and correctly installed/affixed to pump well pit wall (materials - S/S or Al labels).	<input type="checkbox"/>	
11	Check drainage in pump pit/area – confirm fall to drainage point - flush with water to confirm. If sump pump fitted test operation.	<input type="checkbox"/>	
12	Confirm Float Switch if fitted (Pit Flooded) operating correctly.	<input type="checkbox"/>	
13	All pipework sized according to specification. Check against drawings	<input type="checkbox"/>	
14	Pump with the lowest serial number is installed as Pump 1 and nearest switchboard. Subsequent pumps are numbered similarly	<input type="checkbox"/>	
15	If reducer is installed on suction side of pump, to be eccentric to prevent air pocketing	<input type="checkbox"/>	
16	Check all fittings/valves are in accordance with specification. Right handed valves (clockwise to close)	<input type="checkbox"/>	

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GENERAL			
	Item	OK	Comments
17	Water service is installed, correctly working and suitably anchored and protected.	<input type="checkbox"/>	
18	Pump and/or baseplate supported on grout/concrete pad and foundation bolts tight.	<input type="checkbox"/>	
19	Check educt Vent (if fitted) meets specification.	<input type="checkbox"/>	
20	If whirly bird fitted on educt, check it operates.	<input type="checkbox"/>	
21	Check induct vent (if fitted) meets specification.	<input type="checkbox"/>	
22	All handrails, ladders, handposts etc. are secure and useable.	<input type="checkbox"/>	
23	Beams in pump pit/area in place and removable for maintenance.	<input type="checkbox"/>	
24	Fasteners are stainless steel if specified.	<input type="checkbox"/>	
25	All required station labelling is correct and visible.	<input type="checkbox"/>	
26	Check that any additional pump labels provided by manufacturer are affixed to switchboard.	<input type="checkbox"/>	
27	Confirm and record all pump nameplate information. Cross check against specification for accuracy.	<input type="checkbox"/>	
28	Confirm pump guarding is satisfactory and in accordance with AS 4024.	<input type="checkbox"/>	
29	Confirm lifting lug is fitted to pump motors.	<input type="checkbox"/>	
30	Security measures are adequate (where fitted) – gates, fencing, bollards, pump pit covers and switchboards.	<input type="checkbox"/>	
31	WAE Mech. Drawings included with WAE Electrical Drawings & provided on site.	<input type="checkbox"/>	
32	All switchboard doors open/close freely and without any fouling.	<input type="checkbox"/>	
33	If applicable, lifting apparatus is in place (with SWL marked) or access with crane/hiab is available. Ensure that lifting equipment is rated to lift entire pumpset.	<input type="checkbox"/>	
34	Where applicable, adequate ventilation is provided to ensure cooling of pumps (louvers in walls/doors etc.).	<input type="checkbox"/>	
35	All other mechanical items not listed above are in accordance with specification and drawings.	<input type="checkbox"/>	
36	With relevant valves open, start pump in manual mode, check rotation (note direction in comments) and check for leaks, pump/motor vibration and noise and that the flow and delivery pressure are correct in accordance with specifications, repeat for other pump/s .	<input type="checkbox"/>	
37	Hardstand area drains away from site or to stormwater.	<input type="checkbox"/>	
38	Site landscaping completed.	<input type="checkbox"/>	
39	Sufficient lighting if required.	<input type="checkbox"/>	

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## **Appendix C: Commissioning Checklist**

For electrical commissioning checklist, contact Hunter Water.

The civil and mechanical commissioning checklist at the time of publish for this standard is available on the next page. Contact Hunter Water to receive the most recent version of the civil and mechanical commissioning checklist.

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