



# TECHNICAL SPECIFICATION & DRAWINGS

For

SYDNEY CATCHMENT AUTHORITY

LOWER CASCADE DAM SCOUR VALVE  
REPLACEMENT and ANCILLARY WORKS



NSW Water Solutions

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## **SECTION 1 – GENERAL REQUIREMENTS**

# GENERAL

## 1 BACKGROUND

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The existing scour pipeline of the Lower Cascade Dam consists of two scour valves (i.e. DN600 and DN300). The DN600 valve is not functioning correctly and is in need of replacement. The Sydney Catchment Authority has purchased a new valve, which is to be installed in lieu of the existing DN600 scour valve. The upstream side of the DN600 valve is connected to the scour pipeline through a spigot/socket lead joint. This joint does not comply with dam safety requirements.

The scour pipeline from the dam is 600mm for about 3.5m downstream of the DN600 valve and then reduces to 300mm from there onwards. A second isolation valve is installed approximately 10m downstream in a separate concrete pit. Both scour valves locations are not accessible by vehicles. The nearest vehicular access is about 50m away.

As shown on the reference drawing, there is an existing V-Notch weir (constructed of brick) to measure the seepage water flowing through the dam embankment to the side of the location of the scour valves. This V-Notch is located next to the existing DN600 valve pit. The DN300 valve is about 15m downstream of the V-Notch. Due to the continuous seepage flow through the V-Notch the area immediately down stream of the V-Notch is being eroded.

In order to carry out the works, isolation of the scour pipe line will be required. To carry this out divers will install an isolation plate at the entrance of the scour pipeline. This works will not be part of the contract.

Under this contract, the valve already purchased by the SCA shall be installed in a new concrete pit. It is also required to re-construct the V-Notch weir basin with reinforced concrete. Other associated works in this contract includes part removal of the existing valve, sealing and mass concrete filling, drainage works and concrete encasement of the existing steel pipe.

This specification addresses the installation and remedial works for the replacement of the existing scour valve located towards the bottom of the dam, construction of a new valve pit and associated drainage works.

This Section specifies the general technical requirements for all the above works. Details are shown on the contract drawings attached to the end of this tender document. Detailed specifications are given in the following Sub Sections.

Section 1 – General Requirements (this Section).

Section 2 – Civil Requirements.

Section 3 – Mechanical Requirements.

Section 4 – Testing, Commissioning and Demonstration Requirements.

## 2 SCOUR PIPELINE ISOLATION

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The principal will undertake isolation of the scour pipeline from the dam. The isolation mechanism consists of a blank plate with fixing screws and a 100mm valve. The blanking plate and valve will be installed by the principal with divers. The isolation of the scour pipeline and restoration on completion of the works is not part of this Contract.

## **3 EXTENT OF WORKS**

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### **3.1 CIVIL WORKS**

The civil works consist of demolition and disposal, supply of all materials, labour and equipment and construction of the following infrastructure components.

- Construction of a new reinforced concrete pit for the new DN600 scour valve including provision of access stairways, handrails and a grated cover.
- Demolition and disposal of a part of the existing buried concrete wall which is in the area where the new pit will be constructed.
- Demolition and disposal of the existing brick V-Notch weir basin and construction of a new reinforced concrete V-Notch weir basin.
- Clearing and excavation works
- Provision of a drainage system including two drainage pits, a pipeline and a discharge outlet.
- Removal of specified components of the existing DN600 scour valve and provision of a blank flange and sealing the existing so x sp joint inside the pit.
- Mass concrete filling of the existing scour valve pit.
- Turfing and site restoration
- Other associated minor civil works for the proper completion of the works

### **3.2 MECHANICAL WORKS**

The work covered in this section of the specification includes but is not limited to the following:

- Leakage correction of existing valve socket spigot joint by caulking with lead is required.
- Removal of existing DN600 valve internals and installation of a fabricated steel cover.
- Installation of the DN 600 valve and dismantling joint.
- Supply of Valve spindle extension;
- Supply and installation of the DN50 Gate valves.
- The site testing, demonstration and commissioning and the rectification of any defects, if necessary.

## **4 ORDER OF WORKS**

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The following outlines a list of considerations for the Contractor in order to make provisions when developing a construction program:

- Excavate and expose the pipeline to verify pipe size and fittings.
- Demolition of existing in ground concrete wall and V-notch basin.
- Installation of scour isolation within Dam (By others).
- Cutting into the existing DN600 Pipe work.
- Construction of the new valve pit downstream of existing valve.
- Installation of new valve.
- Remove internals of existing DN600 valve and installation of fabricated cover plate.

- Hydrostatic testing of the new valve and the scour pipeline.
- Preparation of existing valve pit for filling of concrete.
- Encasement of the modified existing valve body and connective pipework by filling of existing valve pit with concrete.
- Concrete encasement of pipework in between valve pits and the 300mm V-G coupling.
- Construction of V – Notch Weir and associated structure.
- Construction and installation of access platforms and stairs etc.
- Construction and installation of drainage works.
- Remove scour isolation from within the Dam (By others).

## **5 WORKS**

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### **5.1 EXCAVATION, DEMOLITION AND DISPOSAL**

Demolition works in this contract involves the following:

1. Demolition and disposal of the existing brick V-Notch; and
2. Part demolition of the existing retaining wall for the construction of new valve pit and V-Notch Basin.

Excavation works are required for the following structures:

1. New valve pit;
2. Concrete encasement of the existing 600mm pipe V-Notch;
3. Drainage pits;
4. Discharge outlet; and
5. Drainage pipes.

### **5.2 NEW VALVE PIT**

A new reinforced concrete pit (2300mm x 2500mm x 2550mm) shall be constructed to install the new DN600 valve. The new valve pit shall be constructed next to the existing V-Notch weir basin which shall also be replaced with a reinforced concrete structure. The valve pit shall have a hinged lockable aluminium grated cover.

### **5.3 V-NOTCH WEIR BASIN**

The existing V-notch weir and the basin shall be demolished and disposed off site. A new reinforced concrete weir basin shall be constructed to replace the existing one. Internal dimensions of the weir basin, invert level and the dimensions of the V- Notch shall be similar to the existing one. V-Notch plate shall be made of stainless steel. A lockable stainless steel gauging pin shall also be installed within the v-notch basin.

### **5.4 EXISTING VALVE PIT**

The internals of the existing valve shall be removed and the opening shall be sealed with a fabricated cover. The existing spigot and socket joint shall be caulked with lead if required.

After carrying out the above works, the valve body and pipework shall be checked for leaks. When the sealing is satisfactory the pit shall be filled with mass concrete (Grade 25).

### **5.5 CONCRETE ENCASEMENT OF EXISTING PIPE**

The existing pipe underneath the existing V-Notch (between the existing pit and new pit) shall be concrete encased. The pipe section shall be exposed carefully by removing the soil around the pipe. A minimum of 300mm around the pipe shall be cleared for concrete encasement unless rock is encountered.



Concrete encasement, V-Notch weir and the new valve pit shall be a monolithic reinforced concrete structure i.e. connected with reinforcement.

## **5.6 DRAINAGE WORKS**

Drainage works which includes the following shall be carried out in accordance with Drawing No. 02430231-01 & 03.

1. A 1200mm x 450mm reinforced concrete drainage pit (450mm deep) next to the V-notch weir;
2. A 600mm x 600mm reinforced concrete drainage pit (900mm deep) on the northern side of the new valve pit;
3. A new discharge outlet consisting of a precast concrete headwall and rock rip-rap.
4. DN150 PVC drainage pipeline(s) between pits and to the discharge outlet.
5. Construction of a discharge outlet;
6. Turfing restoration.

Drainage pits can be cast in-situ concrete or pre-cast concrete in accordance with the specification.

## **5.7 TEMPORARY WORKS**

In addition to the above Works, the Contractor shall also carry out necessary temporary works which are briefly described below but not limited to:

- (a) Preparation of Safe Work Method Statement, Erosion and Sediment Control Plan, Environmental Management Plan, Safety Plan and Quality Assurance Inspection and Testing Plan, and;
- (b) Site establishment and disestablishment;
- (c) Erosion and sediment controls and other temporary works required during construction;
- (e) Site restoration of disturbed areas during construction;
- (f) Inspection and Testing;

## **5.8 OTHER WORKS**

In addition to the above works the Contractor shall carry out the following works, which are essential for the proper completion of the Works.

- Provision of spare parts and tools
- Testing, Demonstration and Commissioning of all components
- Site inspections and Rectifying defects during the Defects Liability Period
- Provision of Work-As-Executed documentation
- Provision of Quality Assurance Documentation
- Other minor works not stated above but necessary for the proper completion of the works

# **6 CONTRACTOR'S RESPONSIBILITY**

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The contractor shall be responsible for the installation and commissioning of the equipment specified in this Contract. The contractor shall also ensure that all equipment is suitable for the purpose stated in this specification.

If during the course of the Contract, additional features are considered necessary by the Contractor to ensure satisfactory operation of all equipment and compliance with all guarantees, and then these additional features shall be included in at no extra cost to the Principal. These shall not be considered as Contract Variations.

Be responsible for any and all damages to existing infrastructure which is not being worked on or modified and the structures which are part of the works required but are to remain in intact.

## **7 SECURITY**

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Provide and maintain security by means of fences, gates or other approved methods to exclude other personnel from the Works area at all times for the period of the Contract or until the particular Works are handed over to the Principal. Provide for the security of all materials, plant and equipment on the site. The Contractor shall take responsibility for the security of all materials equipment, components and other property, whether incorporated in the Works or not, until the Works are handed over to the Principal at Practical Completion.

Provide keys for all security gates to the Principal's Representative and ensure free access for authorised personnel at all times for operation or maintenance of the facilities.

## **8 NOT USED**

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## **9 DRAWINGS**

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### **9.1 DRAWING TITLES**

All drawings including manufacturer's standard drawings, workshop drawings, outline drawings and certified drawings required to be submitted by the Contractor, shall clearly define the name of the Contractor, the name Sydney Catchment Authority (SCA), the name of the drawing, together with other relevant details in the title block of the drawing.

Electronic copies of the design drawings will be provided to the contractor in dwg format.

### **9.2 DRAWING NUMBERS**

On the right hand side of the title block shall be shown the Contract Drawing No. This number shall have a letter A, B, C etc, added for the first, second, third etc submission.

The following lists the drawings for the Works:

Proposed works – Layout Plan	02430231 – 01
Valve Pit	02430231 – 02
Drainage and V Notch Weir	02430231 – 03
Access Ladder	02430231 – 04
Valve Pit Cover	02430231 – 05
Thrust Flange and Welded Collar	02430231 – 06

## 10 WORK-AS-EXECUTED DRAWINGS

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### 10.1 GENERAL

All drawings forming part of this contract (drawings submitted by the Principal and drawings produced by the Contractor), after completion of construction and installation, shall be amended by the Contractor to show in detail the "work-as-executed" condition. Amendments necessary to depict "work-as-executed" details shall be carefully and accurately prepared. Maintain an up-to-date set of drawings of the works which show the work-as-executed details as construction of each item is completed.

Submit two (2) draft prints of each WAE drawing within two (2) weeks of completion of each area of work. Submit final Work-as-executed drawings three (3) weeks after receiving feedback from Principal's Representative.

Final Work-as-Executed drawings shall be to the following format:-

- A set of electronic drawings in PDF format and \*.DWG format;
- A hard copy of each drawing in A3 size.

Drawings are to be clearly drawn to scale by certificated draftspersons. Drawings shall specifically relate to this project. Drawings of a generalised nature applicable to a number of models or equipment types are not acceptable.

Submit drawings with border and title block layouts similar to the contract drawings provided.

### 10.2 DELIVERIBLES

All final WAE drawings, Data Schedules and Reports shall have the following certification completed:

<p style="text-align: center;"><b>WORK AS EXECUTED</b></p> <p>I certify that the information shown accurately represents the Work as constructed.</p> <p>Project Name:</p> <p>Contractor:</p> <p>Signature:</p> <p>Date:</p>
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## **11 STANDARD TECHNICAL SPECIFICATION**

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### **11.1 WS – SPEC, WATER SERVICE SPECIFICATION**

This project specification references the current issue of WS-SPEC, including any Addenda, but neither is included herein. WS-SPEC is available from Standards Australia, Customer Services Centre, GPO Box 5420, Sydney, NSW, 2001, telephone: 1300 654 646 and e-mail: [sales@standards.com.au](mailto:sales@standards.com.au). The addenda are available as a free downloads from the website [www.standards.com.au](http://www.standards.com.au), noting that the keywords “water services specification” must be used, as WS-SPEC is not recognised.

The Contractor must make their own arrangement in obtaining a copy.

## **12 LOCATION OF EXISTING SERVICES**

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Existing services (such as drains, watercourses, public utility and other services) obstructing the Works or if damages in the course of the Contract, must be dealt with as follows:

- If the services is to be continued: repair, divert, relocate as required;
- If the service is to be abandoned: cut and seal or disconnect and make safe as required.

Where an existing service obstructs the Works and requires diversion or relocation, the Contractor shall bear all resulting costs and delays, unless the obstruction is a Latent Condition.

Where an existing service is damages by the Contractor for any reason whatsoever, the Contractor shall bear all costs and any delays for repairing or disconnecting the service.

Notify the Superintendent immediately upon discovery of services obstructing the Works not shown in the Contract documents.

## **13 WATER FOR CONSTRUCTION PURPOSES**

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Water required for construction purposes can be sourced from the dam via portable pump. No power is available on site for this pump.

## **14 SITE SERVICES**

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The Contractor shall make his own arrangements for the supply of all site services (such as water, power, telephone etc) required throughout the duration of the Contract.

### **14.1 LOCATION**

Submit full details of proposed works areas, offices, sanitary facilities and stockpile areas at least 5 working days in advance of the intended setting up.

Contractor may use part of the site for their temporary works. Obtain prior approval from the Principal prior to mobilisation.

### **14.2 ACCOMODATION**

No residential accommodation is permitted on site.

### **14.3 SERVICES**

#### **Water**

Water is available free of charge to be pumped out of the dam. Install and maintain all necessary pipes and equipment to supply water to the Contractor's facilities and the Works. On completion, disconnect and remove temporary services.

#### **Electricity**

Main power electricity supply is currently available within SCA premises.

If required, arrange with SCA for provision, distribution and maintenance of the temporary services necessary for execution of the work under the Contract, or use portable generators. On completion, disconnect and remove temporary services, including temporary poles and cables etc.

#### **Telecommunication**

Make arrangements with Telstra or any other service provider for all lines needed for construction purposes, or use mobile facilities. On completion, disconnect and remove temporary services, including temporary poles and cables etc...

#### **Waste Water/Sewerage Disposal**

Install and maintain all necessary services. Obtain all necessary approvals for the disposal of wastewater to SCA or Council requirements. On completion, disconnect and remove all traces.

#### **Garbage Disposal**

Disposal of garbage or other putrescent rubbish from the Contractor's activities on or around the site is not permitted on the site. Make arrangements with Council for disposal off-site to an approved Waste Disposal Centre.

#### **Demobilisation**

Upon completion of the Works, disconnect and remove all temporary services, clear away all traces and restore areas in accordance with this Specification.

#### **Use of facilities**

The Principal and their representatives must be given full and free use of all services and of ablution and sanitary facilities provided by the Contractor for the Contractor's employees.

## 15 QUALITY ASSURANCE

### 15.1 GENERAL

The superintendent reserves the right to inspect all materials prior to their dispatch from their place of manufacture.

The Contractor must advise the Superintendent in writing when the materials will be available for inspection. A minimum of (5) five working days notice shall be given.

The Superintendent's inspection costs will be borne by the Superintendent. However, in the case the inspected material has been rejected as not complying with the Specification, the cost of the subsequent inspection(s) shall be borne by the Contractor.

Arrange Witness and Hold Points so that all inspections for the Witness and Hold Points can be completed by the Principal's Representative by 4.30 pm, unless otherwise agreed and arranged. Provide at least 7 days notice to the Principal's Representative to arrange technical specialists.

The points listed below shall be included in the Inspection and Test Plans. Include additional "Hold" and "Witness" Points which are considered necessary for the Contractor's verification such as mandatory inspections by Statutory Authorities. Further details are given in PRELIMINARIES, QUALITY ASSURANCE.

**Table 1 – Quality Assurance Requirements**

<b>Activity Requiring Inspection and Test Plan</b>	<b>Stage of Work Requiring Inspection or Test</b>	<b>H or W Point (for Attendance by Principal's Representative)</b>
<b>GENERAL</b>		
OH&S Plan; QA Requirement, Erosion and Sediment Control Plan; Environmental Management	Prepare Safe Work Method Statement, Safety Plan, Inspection and Test Plan and ERSC Plan	H
Environmental protection	Environmental measures in place prior to commencement of physical works	H
<b>CIVIL WORKS</b>		
Earthworks	Setting out	H
	Exposure of pipe	W
	Prepared foundation for pits	H
Concrete works	Various stages of concreting	W
	After stripping off formwork	W
	Prepared surface for mass concrete filling	H
Hydrostatic testing	Prior to mass concrete filling	H
	Prior to concrete encasement	H
<b>GENERAL (FOR ALL SITES)</b>		
Testing	Pipe works valve removal/installation	H
WAE Drawings	Within four weeks after each work completed	W
Completion of contract	Site restoration	W
	Final inspection	H

(Note: Further hold and witness points may be specified in individual sub sections. Principal's Representative may add, omit or amend the above schedule)

17 EROSION AND SEDIMENT CONTROL

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The Contractor shall prepare an Erosion and Sediment Control Plan (ESCP) in general conformance with *Managing Urban Stormwater, Soils and Construction* (Landcom 2004).

In the ESCP, specific erosion and sedimentation control measures shall be included for all work areas encompassing diversion channels and drains, table drains and/or revegetation and stabilisation of slopes.

The Contractor shall:

- Plan and carry out the whole of the Works to avoid unnecessary disturbance to the ground surface which would lead to erosion and sedimentation of the site, surrounding country, watercourses, drainage systems and water bodies.
- Comply with the requirements of the Protection of the Environment Operations Act 1997, the Rivers and Foreshores Improvement Act 1948, Water Management Act 2000, the Soil Conservation Act 1938 and the Water Act 1912

Areas requiring erosion and sediment control measures shall include:-

- Construction area;
- Access and haulage tracks;
- Stockpile and storage areas;
- Spoil disposal areas (both on-site and off-site);
- Compound areas, such as Contractor's facilities and pipe and material storage areas.

The ESCP Plan shall consist of scale diagrams indicating the following:

- Features of the site including contours if applicable or ground and drainage paths layouts and elevations.
- Relevant construction details of all erosion and sedimentation control structures.
- All permanent and temporary erosion and sedimentation control measures, including the control measures to be implemented in advance of, or in conjunction with, clearing and grubbing operations.
- An order of works based upon protection, stabilisation and/or construction of all surface drainage works at the earliest practical stage.
- Proposed time schedules for construction of structures and implementation of measures to control erosion and sedimentation.

Construct all erosion control measures before site clearing and subsequent operations are commenced. Ensure that effective erosion and sedimentation control is provided at all times during the Contract. Monitor erosion and sediment control measures daily. Secure all works at the end of each daily shift for possible overnight erosion events.

Provide and maintain erosion controls and sediment traps to (a) areas disturbed by site activities; (b) entrances to drains and creeks; and (c) completed Works until fully restored.

Stockpile only materials necessary for orderly and efficient execution of the Works. Provide silt barrier around stockpile or cover to prevent loss of sediment and other stockpiled material. Do not stockpile materials in areas subject to stormwater runoff. Divert runoff around stockpiles.

Take all necessary steps to protect creeks, drains and watercourses from pollution resulting from the Works. Provide silt fences and silt traps where required. Maintain silt traps/fences for the entire duration of the construction and also during defects liability period if required.

Stabilise any access road or track to the site of the works and install erosion control works to prevent erosion of the access road formation and off-road drainage. Minimal access of road is to be constructed. Access tracks shall ideally be located down the ridgelines and constructed with lead-outs to stable areas.

Provide catch drains to intercept stormwater, and divert runoff to stable areas.

Ensure that catch drains and drainage structures are well formed, clear of obstructions and drain freely. Remove collected sediment.

Temporary erosion and sedimentation control measures shall be removed by the Contractor when revegetation has established and the site is stable. All materials used therein shall be removed from the site and disposed by the Contractor.

## **18 SOIL AND WATER MANAGEMENT**

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### **18.1 DISPOSAL OF PUMPED WATERS**

The Contractor shall observe relevant NSW Department of Environment and Conservation, Department of Natural Resources (DNR) and Council conditions and licensing requirements. Incorporate silt traps and protect stormwater and open drains from entry of silt, spoil and other materials.

Direct water pumped from excavated trenches through sediment filters to undisturbed ground and disposed of in a manner acceptable to the NSW Department of Environment and Conservation and Department of Natural Resources and the Principal.

Construct stormwater diversion works and erosion and sediment controls before commencing works and maintain them on a regular basis for the duration of the Works.

### **18.2 CONTAMINATION**

Prevent contamination of waterways and other lands. If contamination occurs, notify the Principal, the Council, NSW Department of Environment and Conservation and Department of Natural Resources (DNR) immediately and comply with requirements. Make good any damage.

#### **Contaminated soil**

Imported material shall not contain any weeds or organic material. Clear any noxious or poisonous weeds if identified. Do not transport contaminated soil off the site without the approval of the Principal.

### **18.3 ACCESS TRACKS**

Where an access track is to be constructed, the finished surface level should be similar to the adjacent ground levels. Construction should encourage runoff to sheet across the track where there is natural side slope and not be concentrated or diverted by the track.



**END OF SECTION 1 - GENERAL**

## **SECTION 2 – CIVIL REQUIREMENTS**

# CIVIL

## 1 GENERAL

---

### 1.1 EXTENT OF WORKS

The Contractor shall carry out the following civil works under this contract variation. The works include supplying all materials, labour and equipment and construction of the following infrastructure components.

1. Construction of a new reinforced concrete pit for the new DN600 scour valve including provision of access stairways, handrails, an internal ladder and a grated cover.
2. Demolition and disposal of a part of the existing buried concrete wall which is in the area where the new pit will be constructed and at V-notch basin.
3. Demolition and disposal of the existing brick V-Notch weir basin and construction of a new reinforced concrete V-Notch weir basin.
4. Clearing and excavation works for the following structures:
  - a. New valve pit and associated pipework,
  - b. Concrete encasement of existing pipe, and
  - c. New drainage pits, drainage pipe and discharge outlet.
5. Concrete encasement of the existing pipe section under the V-Notch and DN300 V-G coupling.
6. Provision of a drainage system including two drainage pits, a pipeline and a discharge outlet.
7. Removal of specified components of the existing DN600 scour valve and provision of a blank flange and sealing the existing so x sp joint inside the pit.
8. Mass concrete filling of the existing scour valve pit.
9. Turfing and site restoration.
10. Other associated minor civil works for the proper completion of the works.

In addition to the above works, the Contractor shall carry out all necessary temporary works for construction works. All the above works are further described in Section 1.2. This specification shall be read in conjunction with other sub sections and the construction drawings provided with the tender document.

### 1.2 DESCRIPTION OF CIVIL WORKS

#### New Valve Pit

A new reinforced concrete pit shall be constructed to install the DN600 valve which will be supplied by the Principal. Construction of the valve pit includes the following.

1. **Clearing and excavation works:** Bed rock is expected at this location just below the existing pipe invert level. If only a part of the pit base is to rest on bed

rock the remaining area shall be filled with mass concrete from the bed rock. Provide anchor bars into rock from mass concrete fill.

2. **Demolition works:** There is a buried concrete wall running parallel to the scour pipeline at this location. A part of this retaining wall (in the area of the new pit) and the existing V-Notch shall be demolished and disposed off site. Carry out earthworks in accordance with Clause 2 of this specification.
3. **Concrete Works:** All structural concrete works shall be of Grade 32. Refer to Clause 3 for further details.
4. **Valve Installation:** Refer to Sub Section 3 – Mechanical Works.
5. **Pipework:** Refer to Sub Section 3 – Mechanical Works and Clause 5 of this Sub Section. The design drawings are based on the assumption that the existing pipeline downstream of the existing valve is DN300. The contractor shall verify types and sizes of existing pipes prior to placing the order for pipes and fittings.
6. **Stairways, covers and handrails:** Galvanised iron external stairways to the pit and from the pit to the V-Notch shall be provided with necessary handrails. A lockable aluminium grated cover shall be provided for the pit.

#### **Concrete Encasement of Existing Pipe and Re-construction of V-Notch**

The existing V-Notch weir basin shall be demolished and disposed off site. The existing scour pipe shall be exposed by careful excavation. After installation of the new valve with necessary pipe fittings the pipe sections upstream of the new valve pit and the DN300 V-G joint shall be concrete encased. The new V-Notch shall be constructed on top of the concrete encasement between the two valve pits.

The new V-Notch shall have similar hydraulic characteristics of the existing brick V-notch and therefore the Contractor shall obtain measurements of the existing V-Notch (i.e. basin level, overall dimensions, V-Notch plate measurements etc.) prior to demolition. The V-Notch plate shall be made of stainless steel and fixed to the concrete at the same height of the existing weir. An adjustable gauging pin shall also be provided. An aluminium grating shall be provided to access the gauging pin for flow measurement purposes. The pin, V-Notch and the grating shall be positioned at suitable locations considering the direction of access which is from the new valve pit. The grating and the stairway shall be fixed to concrete supports on the weir basin. The grating and the end of stairway shall be at least 50mm above the maximum water level in the weir basin. The valve pits, drainage pit, V-Notch, concrete encasements and concrete blocks (supporting grating and stairway) shall be a monolithic concrete structure (i.e. reinforcement to be continued through).

#### **Drainage Works**

A drainage system to discharge seepage water overflowing from the V-Notch and any water that leaks out from the valve pit shall be provided as shown in drawings. The system shall consist of the following components:

1. A 1200mm x 450mm reinforced concrete drainage pit (450mm deep) next to the V-notch weir;
2. A 600mm x 600mm reinforced concrete drainage pit (900mm deep) on the northern side of the new valve pit;
3. A new discharge outlet consisting of a precast concrete headwall and rock rip-rap.
4. DN150 PVC drainage pipeline(s) between pits and to the discharge outlet.

Approximate locations of pits, pipes and discharge outlet are given in drawings. These locations may be slightly changed to suit site conditions. The 1200x450 pit shall be constructed next to the V-Notch plate enabling water from the V-notch to overflow into the pit freely.

### **Existing Valve Pit**

The specified parts of the existing valve shall be removed and the opening shall be sealed with a fabricated cover. The existing socket/spigot joint shall be caulked with lead. Further details are given in Sub Section 3.

Upon successful completion of the above pipe work (including testing), the valve pit shall be filled with mass concrete in accordance with Clause 3.10 of this specification.

### **Turfing and Site Restoration**

The area immediately downstream of the existing V-Notch is subject to erosion due to improper drainage. At the completion of the construction works, the surround area (including the eroded area) shall be turfed. All other areas which are disturbed due to construction works shall be restored in accordance with Clause 2.8 and 6 of this specification.

## **2 EARTHWORKS AND FOUNDATION PREPARATION**

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Earthworks in this contract include:

- Clearing and top soil removal, stockpiling and resspreading
- All types of excavation and backfilling
- Restoration & Turfing
- Backfilling and disposal

Contractor shall examine the site and carry out necessary investigation to get a thorough idea about the type of soil which may be encountered during excavation. If the excavated material is not suitable for re-use imported material should be used as specified in this specification. Contractor shall make due allowances in their contract prices as no extra payment will be made should imported material be used. Drawings of the existing scour line and geotechnical investigation results are available with the Contact Officer. Contractors may refer to these drawings to obtain further information.

### **2.1 CLEARING**

The area to be occupied by the Works, shall be cleared of trees, stump and scrub by grubbing to at least 200 mm below natural surface or foundation level, whichever is the lowest. Except for the vegetation in the area to be occupied by the permanent works, the vegetation on site including all trees, shrubs and ground cover shall be protected and not damaged unnecessarily.

### **2.2 TOPSOIL**

Before commencing excavation, topsoil shall be stripped from the area to be occupied by the Works. The stripped topsoil shall be stockpiled for reuse and restoration of the site. Topsoil is defined as the surface or top 100 mm to 150 mm layer of soil including fine roots, vegetation and overlying grass and is characterised by the presence of organic matter. It shall be free from weeds, sticks, rubbish and material toxic to plant growth.

### **2.3 EXCAVATION**

Following stripping of topsoil, excavation is designated as “all classes” and is defined as all excavation, irrespective of the type of material or its condition. Excavation shall be carried out carefully to avoid damages to existing pipes and pits.

The Contractor shall excavate to the lines, dimensions, levels and other requirements specified in the drawings or as required. The Contractor shall preserve in the soundest possible condition the material below and beyond the lines of all excavation. If material is excavated below or beyond the required excavation or foundation materials are loosened, the over-excavation or loosened material shall be filled with or replaced by mass concrete at the Contractor's expense.

Explosives shall not be used in any excavation or demolition of existing structures without the prior approval from the Principal.

Selected portion of the excavated material may be re-used to backfilling. Other surplus and unsuitable excavated materials from all excavations shall be disposed out of site in an appropriate manner.

## 2.4 TOLERANCES

### Horizontal Tolerances

The horizontal location of any point on the surface of excavations shall not differ from the corresponding point given in the drawings, by more than  $\pm 50$  mm.

### Vertical Tolerances

The heights of surfaces for excavations measured anywhere shall not vary from those given in the drawings, by  $\pm 50$  mm.

## 2.5 COMPACTION REQUIREMENTS

If required, compaction of filled material shall be carried out as follows.

Place fill material in near horizontal layers. Loose layer thickness shall not exceed 150 mm.

Limit maximum particle size to two-thirds of the compacted layer thickness.

Moisture content during compaction shall generally be 1% dry to 2% wet of the optimum.

Compact the soils to the following minimum standard dry density ratios (AS1289.5.4.1) for cohesive materials and density indexes (AS1289.E6.1) for cohesionless soil:

		Minimum Compaction	
		AS1289.5.4.1	AS1289.E6.1
(1)	General filling of the site	95% standard	60%
(2)	Fill supporting structures		
	(a) top 0.5m	100% standard	80%
	(b) greater than 0.5m below structure	98% standard	70%

Use Hilf Density Ratio - Rapid method (AS1289.5.7.1) for compaction control.

Determine in-situ dry density by sand replacement method (AS1289.5.3.1).

Record all tests performed, including defined location details for each in situ test.

Compacted sub-grade for drainage pits should achieve a minimum bearing capacity of 75 Kpa. The new valve pit is expected to be on bed rock or mass concrete fill from bed rock.

## 2.6 PREPARATION OF FOUNDATION FOR CONCRETE STRUCTURES

### Inspection and Approval

All foundations are to be inspected by the Principal's Representative at the completion of excavation and/or prior to placing concrete or fill materials. Submit to the Principal's Representative not less than 2 working days of foundations being ready for inspection. Generally, inspections will be made immediately after clean-up.

### Requirement

Where foundations for concrete structures are not excavated to rock prepare the surface by one of the methods specified below to ensure that a firm and reasonably dust-free working

surface is achieved which has the required bearing capacity and shall not break-up while placing concrete. The minimum required bearing capacity is 75kPa unless otherwise specified elsewhere.

Foundation for pits shall be either (a) solid bedrock; (b) compacted fill; or (c) part mass concrete fill and part rock surface. The pits should not rest partly on rock and partly on compacted earth fill.

## 2.7 BACKFILLING

### Requirement

Place and compact fill adjacent to concrete structures with such equipment and in such a manner that no damage to the concrete structure results. Use special compaction within one metre of all concrete structures. Vibratory rollers shall not be used within 2m of concrete structures.

### Fill Density

Compact selected material in layers to a dry density ratio of 95% of the maximum dry density. The dry density ratio shall be determined using the standard compaction method in AS1289. Use all such equipment and number of passes as necessary to achieve the specified compaction.

## 2.8 TURFING

The area between new pits and the currently eroded surround area (approximately 50 m<sup>2</sup>) shall be turfed to the following specification.

Remove temporary works including all debris, rocks and the like from areas where temporary works occupied. Rip the area to about 100 mm and clean the surface to be free from vegetation, roots, large stones, clods etc.

Spread topsoil to a depth of 40-60 mm over the area and trim to a suitable slope to match with the existing topography.

Apply fertiliser (Starter 12/15) evenly on the top soil at a rate of 200 kg/ha. Loosen topsoil immediately prior to application of fertiliser.

Lay the approved turf to suit the existing grass and peg securely to the ground. Placement of turf rolls shall be in accordance with the manufacture's specification. Protect, maintain and irrigate the turf as required until the final completion.

## 3 CONCRETE WORKS

### 3.1 REQUIREMENTS

All concrete work shall comply with the following:

- AS 3600 Concrete Structures
- AS 3735 Concrete Structures for Retaining Liquids
- Section SP44 Concrete Supply Standard Class (Refer WS-SPEC)
- Section SP45 Concrete Supply Special Class (Refer WS-SPEC)
- Section TR10 Concrete Placement (Refer WS-SPEC).

Minimum requirements for concrete to be used for this Contract are given in the table below:

### 3.2 CONCRETE CLASSES AND GRADES

SUPPLY TO THE REQUIREMENTS OF:		Section SP44		Section SP45			
CONCRETE MIX TYPE:		G	B	RC	SGE	WT	PC
CLASS AND GRADE:		N20	N25	S32	S40	S40	S40
MATERIALS	Cement Type	-	-	SL	SR	SR	SL

and MIX	Minimum Cementitious Material (kg/m <sup>3</sup> )	-	-	360	380	380	380
	Maximum Cementitious Material (kg/m <sup>3</sup> )	-	-	-	450	-	-
	Max Aggregate Size	-	15	25	25	25	25
	W/C Ratio Maximum	-	-	0.5	0.45	0.45	0.45
	Laboratory Trial Mix Required (Yes/No)	No	No	Yes	Yes	Yes	Yes
STRENGTH GRADE	f 'c at 28 days (MPa)	20	25	32	40	40	40
OTHER	Nominal Slump (mm)	80	80	*	*	*	*
	Drying Shrinkage (strain x 10 <sup>-6</sup> ) at 3 weeks OR {8 weeks}	-	-	500 {600}	500 {600}	500 {600}	500 {600}
	Air Content %	-	-	-	-	-	-
	Pumped Concrete Accepted Yes/No	Yes	Yes	Yes	Yes	Yes	Yes

- not specified \* as determined by placement method (max. 80, water based)

Use the following Classes and Grades for respective structures.

Structure	Cement Type	Class and Grade	Characteristic Strength (MPa)
Valve Pit	SL	RC S32	32
V-Notch	SL	RC S32	32
Concrete encasement of pipes	SL	RC S32	32
Stormwater pits- insitu/pre-cast*	SL	RC S32/40*	32/40*
Concrete filling in valve pit	SL	RC 32	32
Mass concrete and blinding concrete	GP	G N25	25

### 3.3 REINFORCEMENT

#### Type and Grade

Reinforcement shall be of:

Grade 500N and deformed round bars when designated N

Grade 250N and plain round bars when designated R

Grade 500L for welded mesh to the requirements of AS/NZS4671 “Steel Reinforcing Materials”.

#### Splicing

Splicing of reinforcement shall be to the requirements of AS3600 unless otherwise specified on the Drawings.

#### Concrete Cover

Provide sufficient cover to reinforcement as per AS3600 and AS3735 and as specified.



Structure	Location	Concrete Cover (mm)
Valve pit	All faces	40
Stormwater pits	- Water face	40
	- Soil face	25
V-Notch	All faces	40
Other structures – As per AS3600 & AS3735		

### 3.4 CONCRETE PLACEMENT, FINISH AND TESTING

Place concrete as per TR10 and test as per SP44 and SP45.

Do not use curing compounds or any admixtures without prior approval of the Principal. Minimum period between adjacent pours shall be not less than 7 days.

Provide surface finish as below.

Structure	Finish (Classification as per Cl 6.7, 6.8 of TR10)
V-Notch	U3/F3
Stormwater pits	U2/F2
Valve pit	U2/F2
Other exposed concrete	U3/F3
Unexposed concrete (underground or covered)	U1/F1

### 3.5 CURING AND PROTECTION

Protect fresh concrete from premature drying and excessively hot or cold temperatures. Maintain the concrete at a reasonably constant temperature with minimum moisture loss during the curing period.

Carry out curing as per TR10.

Use moist curing for all liquid retaining structures.

Protect finished concrete surfaces from damage from any cause, including mortar splashes and stains, timber stains, rust stains, chemical attack, additives, curing compounds, protective coatings, rain, running water, and the like.

Concrete is liable to be rejected if surfaces are damaged. Rectification may be attempted only if prior approval is given.

### 3.6 CONCRETE REPAIRS

#### General

Following the removal of formwork, open out all air voids. Repair all air voids, bolt holes and honeycombing using a suitable epoxy mortar applied strictly in accordance with manufacturer's instructions. Use epoxy mortar as nominated in Section TR10.

Repairs by bagging and cement mortar will not be permitted.

#### Form Ties

Terminate embedded form ties at least 20mm from the formed face of the concrete. Ties shall be such that the end fasteners can be removed without causing spalling of the face of the concrete. Fill recesses so caused with epoxy mortar. Keep form ties 30mm clear of reinforcement. Do not use formwork to support reinforcement.

#### Old concrete

Open voids, chip and clean until hard concrete is exposed. Fill and repair using a suitable epoxy mortar applied strictly in accordance with manufacturer's instructions. Use epoxy

mortar as nominated in Section TR10. Repairs by bagging and cement mortar will not be permitted. For larger voids, use concrete with non-shrinking agent after applying binding agent to the cleaned surface.

### **3.7 CONSTRUCTION JOINTS**

Prepare surfaces of construction joints to requirements of Section TR10, Clause 6.5, prior to placement of concrete.

Joint surfaces against which concrete are to be poured shall be completely free of foreign matter prior to concrete placement.

Provide a two-part polyurethane sealer on water faces of construction joints for water retaining structures.

### **3.8 BLOCKOUTS AND CORED HOLES**

Wire brush all pipework and metalwork to be cast into the concrete and remove all traces of dust, grease, rust and paint prior to the placement of concrete. Additionally for ductile iron pipework power tool clean the manufacturer's external pipe coating from section to be cast or grouted into concrete.

Scabble and treat with an epoxy compound blockouts and cored holes to be grouted. Use the epoxy nominated in Section TR10 strictly in accordance with the manufacturer's instructions and/or recommendations.

Firmly hold in the correct position pipework and metalwork to be built into concrete while the concrete is placed. Coat surfaces of pipework and metalwork, after removal of all dust, grease, rust, paint, etc, with a bonding compound compatible with the grout. Use a self-expanding grout.

Connect pipes to water retaining structures with a puddle/thrust flange.

### **3.9 TOPPING AND BENCHING**

Minimum thickness of benching to be 25mm. Use same cement content of topping mix to that of structural concrete being topped or benched. Apply epoxy as nominated in Section TR10 on prepared concrete surface prior to placing. Mix design and placing shall be such as to ensure the topping or benching is dense, uniform and the surface free from blemishes.

### **3.10 MASS CONCRETE FILL IN THE EXISTING PIT**

After carrying out necessary works related to dismantling of valve parts and sealing of joint (as specified in Sub Section 3) and testing, the existing valve pit shall be filled with mass concrete (Grade 32) up to 300 mm above the blank flange. Prior to filling, the surface of internal walls of the pit shall be thoroughly cleaned and chipped (roughened). Apply a bonding agent or cement grout just before pouring concrete. Ensure the old and fresh concrete are bonded together and there is no chance of water seeping through the joint.

Provide a DN100 PVC drain pipe through the pit wall to the V-Notch basin. Slope the finished top level of concrete fill towards the drain pipe so that rainwater does not pond within the pit.

### **3.11 CONCRETE ENCASEMENT OF EXISTING STEEL PIPE**

The section of the pipeline to be concrete encased shall be exposed by excavating surround soil and cutting and removal of the existing concrete wall. A minimum clearance of 300mm around the pipe is required for concrete encasement unless rock is encountered. In the scour pipeline, rock is anticipated under the pipe and therefore in such a case, a gap of 100mm would be sufficient. Provide anchor bars into bedrock from concrete encasement (16mm bars at 300mm spacings on either side of the pipe with minimum of 500mm into the rock).

Clean the external surface of pipe and place concrete with reinforcements as shown in drawings. The reinforcements shall continue to the V-Notch weir basin. Grade 32 concrete shall be used for both concrete encasement and V-Notch.

## 4 DRAINAGE WORKS

### 4.1 GENERAL

This specification covers the following works.

- Provision of concrete drainage pits (pre-cast or cast in-situ)
- Supply and installation of drainage pipes
- Provision of a discharge outlet

### 4.2 MATERIALS FOR PIPES AND PITS

#### PVC Pipes and Fittings

Standards: To AS/NZS 3500.3

To Section SP4 and the following:

INFORMATION TO BE SUPPLIED	PROJECT REQUIREMENTS (*See Practices Table of Sections SP4 & SP15)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	<i>Stormwater drainage – Non-pressure pipes</i>
Series 1 (metric) or Series 2 (cast iron OD)	<i>Not applicable</i>
Pipes <ul style="list-style-type: none"><li>- Nominal size(s)</li><li>- Class(es)</li></ul>	<i>DN150 PVC Class 12, RRJ (Pressure pipe)</i>
Fittings <ul style="list-style-type: none"><li>- Type (pressure, non-pressure)</li><li>- Nominal size(s)</li><li>- Class(es)</li><li>- Types</li></ul>	<i>Pressure DN150 Class 12 Socketed RRJ</i>
Elastomeric seal material and lubricant	<i>Required</i>
Bactericidal lubricant	<i>Not required</i>
Acceptable Product Verification Report	<i>Manufacturers without Product Cert. to supply</i>
Certification of Compliance, to Section SP4	<i>Manufacturer to supply</i>

#### Drainage Pits

#### PRE-CAST PITS

##### Concrete

REQUIREMENT: To AS 4198

Admixtures: To be identified and recorded

##### Reinforcement

REQUIREMENT: Steel bars, steel wire or welded wire fabric complying with AS4671 and to manufacturer's design to satisfy clause 2.13.8 of AS3500.3:2003.

Clear cover to reinforcement: 35 mm (min) for stormwater pits

Un-reinforced pre-cast pits/trenches shall incorporate a safety wire of not less than 3 mm nominal diameter as a safeguard against handling.

##### Dimensions

Pits: Internal dimensions are given in drawings.

TOLERANCES: Wall thickness  $\pm 6$  mm

Height  $\pm 8$  mm

### Load test

Proof load test as per Section 6 of AS4198 and in accordance with cl.2.13.8.1 of AS3500.3:2003.

Test loads: Type L (for non-trafficable areas)

### Concrete durability

GRADE: Minimum strength 40Mpa

COVER: To AS 4058, unless otherwise specified in AGENCY PRACTICES - CLAUSE 5.4 of SP-8.

CURING: To either of the following:

Steam curing: Commence minimum one hour after completion of concrete placing and keep the rate of increase in pipe temperature, and subsequent decrease, at a uniform controlled rate until the concrete has attained a minimum of 50% of its characteristic compressive strength.

Moist curing: Cure continuously, externally and internally, until the concrete has both attained a minimum of 50% of its characteristic compressive strength and has cured for a minimum of 7 days.

### IN-SITU CAST PITS

As shown in drawing. Minimum concrete Grade is 32MPa. Construct in accordance with *CONCRETE SPECIFICATION*.

### METAL ACCESS COVERS AND GRATES

Standard: To AS 3996.

Grate type: Valve Pit: Lockable aluminium grated cover hinged or bolted to pit walls.

Drainage pit (600 SQ): Removable aluminium grating.

Drainage pit (1200 x 450): Removable aluminium grating.

Loading: Type A (All gratings)

## 4.3 INSTALLATION OF PIPES AND PITS

### Pipes

Drainage pipes shall be laid to a minimum gradient of 1% unless invert levels are given in drawings. Install the non-pressure pipelines in compliance with Section TR14 and to the following:

INFORMATION TO BE SUPPLIED		PROJECT REQUIREMENTS
SECTION TR14	CLAUSE	DETAILS
Pipe materials and sizes	3.1	<i>As specified</i>
Markings and marker tape	4.15	Not required
Geotechnical	-	<i>Available with the Contact Officer</i>
Embedment details - pipeline minimum covers - bedding minimum thickness - clearance minimum widths - overlay minimum thickness - embedment materials - trench fill materials	4.2	-] -] -] - Refer Drawing TR14 -] -] -]

Pipe supports	4.11	Not required in this contract
Trench stops and bulkheads	4.8, 4.9	Not required in this contract
Property connections	4.13	Not required in this contract
Testing (option(s) and length) - pipelines and structures	2.3	- Visual inspection

## PITS

### Excavation & Foundation Preparation

Carry out excavation or filling works for the foundation in accordance with other sections of this specification. Backfill over excavation or loosened material with compacted earth backfill for soil foundations and concrete backfill for rock foundations. Unless otherwise specified or directed, backfill concrete placed in the foundations or adjacent to concrete structures shall be Class N25. All such work shall be at the Contractor's expense.

Whether the foundation is on original ground or on a fill, ensure a minimum bearing capacity of 75kPa. If the pit rests partly on bedrock the remaining part shall be filled with mass concrete from bedrock and anchored.

#### Blinding concrete layer

Place a layer of 50 mm thick Grade N25 blinding concrete on prepared foundation areas as soon as possible after and within 72 hours of excavation and foundation preparation. Plant and equipment shall not work or travel on the blinding layer.

#### Finish to exposed surfaces

General: Provide a smooth, seamless finish, using steel trowelled render or concrete cast in steel forms.

Corners: Cove or splay internal corners.

Cover levels: 25 mm above finished surface.

## 4.4 DISCHARGE OUTLET

Construct the discharge outlet using a pre-cast concrete culvert headwall and a riprap as shown in drawings. The headwall shall be either cast insitu or Pre-cast concrete unit from CSR Humes Pty. Limited (or equivalent) as per RTA QA Specification R11.

A 150mm thick rock filled Reno mattress shall be provided at the base of the headwall as an erosion preventive measure followed by randomly placed boulders to dissipate energy of the discharged water. Provide geo-textile under the Reno mattress.

Indicative location for discharge outlet is shown in drawings, however, exact location to be agreed on site. The Contractor shall set out the structure on site and obtain approval from Principal's Representative prior to proceed with construction. The outlet shall be located such a way that it would ensure minimum clearing of vegetation.

## 5 PIPE WORK

### 5.1 GENERAL

The Works covered in this section comprise the supply of all plant, labour and materials and installation of pipes and fittings associated with the installation of the scour valve. All accessories required to restore the scour pipeline such as pipes, fittings, couplings etc. (except the DN600 valve) shall be provided by the Contractor.

Pipe laying includes excavation, bedding, laying, jointing, concrete encasement, backfilling, compacting, testing and restoration.

Pipeline shall be set out on site and agreed with Principal's Authorised Person prior to placing the order for pipes and fittings. Types and sizes of existing pipes shall be verified after excavating and exposing pipes.

## 5.2 STEEL PIPES AND FITTINGS

All pipes shall be epoxy coated steel pipes in accordance with WS-SPEC - SP1, TR20 and to the following specification.

ITEMS	PROJECT REQUIREMENTS (* See Practices Table of Sections SP1)
Application (water: potable/non-potable, sewerage, pressure/non-pressure)	<i>Water, non-potable, pressure</i>
Pipes <ul style="list-style-type: none"> <li>- Nominal size(s) (to Table C1, AS 1579)</li> <li>- Wall thickness and steel grade</li> <li>- Length (exact or random)</li> <li>- Joint type(s)</li> <li>- Angular joint deflection</li> <li>- Coating and lining</li> </ul>	<ul style="list-style-type: none"> <li>- DN600</li> <li>- Minimum yield strength – 300MPa and wall thickness to be not less than 4.8mm</li> <li>- Length to suit (Refer to drawings)</li> <li>- Welded or flanged joints</li> <li>- N/A</li> <li>- External: Epoxy coating as per WS_SPEC TR20 or FBPE coating to SP1/AS4321</li> <li>- Internal: Cement lining to SP1/AS1281 or epoxy coating as per TR20</li> </ul>
Fittings <ul style="list-style-type: none"> <li>- Nominal size(s) (to Table C1, AS 1579)</li> <li>- Type(s) and jointing</li> <li>- Coating and lining</li> </ul>	<ul style="list-style-type: none"> <li>- DN600</li> <li>- Flanged and welded joints as applicable</li> <li>- External: Epoxy coating as per WS-SPEC TR20 or FBPE coating to SP1/AS4321</li> <li>- Internal: Cement lining to SP1/AS1281 or epoxy coating as per TR20</li> </ul>
Welded collar (banded) joints	<i>Not Required</i>
Flanged joint bolting selection (excluding valves)	<i>Stainless steel Grade 316.</i>
Flange gaskets, O-rings and lubricants	<i>Flange gaskets required</i>
Elastomeric seal material and lubricant	<i>N/A</i>
Bactericidal lubricant	<i>Not Required</i>
Acceptable Product Verification Report	<i>Manufacturers to supply</i>

All required pipes and fittings for the installation of the valve shall be welded or flanged joints except the end connections (to the existing pipes) which are stainless steel mechanical couplings (V-G or equivalent). The Contractor shall excavate and expose the existing pipes; verify pipe types and sizes; prepare a list of pipes and fittings to suit existing pipe types/sizes for approval of the Principal. Pipes and fittings shall not be ordered without verifying types and sizes on site.

All welded fabrications such as flanges, reducers, thrust flanges etc. are expected to be carried out in the factory and only bolted joints are to be carried out on site.

### 5.3 PIPE INSTALLATION

Supply, lay and joint pipes and fittings as shown in drawings and described in this specification.

Contractor's work includes:

- Clearing of the line; setting out; barricading; excavating the trench in all classes of material including rock of all hardness and freshness; trench supports and dewatering; cutting and disposing existing pipes as required; bedding, laying and jointing of pipes; backfilling of the trench including selected backfill or concrete encasement; disposal of cleared vegetation, rubbish and surplus excavated material; and restoration of surfaces.
- Supply necessary fittings and installation of the scour valve with associated fittings; construction of valve pits; and corrosion protection of pipes, fittings and joints as required.

#### Pipe Laying

Provide and use drag scrapers or "detectors" to ensure that the interior of the pipeline is clean and free from obstructions. Timber or plugs shall be provided and used to prevent any material from entering sections of the pipeline, which are left incomplete overnight. In extremely wet conditions, place separation membrane such as Bidim U34, Terram 1000 UV or equivalents.

Pipe lengths shall be cut as needed or directed to suit closing lengths, to replace damaged parts, or to remove sockets if necessary when jointing to a socketed fitting.

Take every precaution to prevent damage to existing services. If, however, the Contractor damages a service, shall notify the responsible person or Authority.

Complete all new pipe work in the area(s) specified in the contract drawings including hydrostatic pressure testing. Construct the valve pit in accordance with Drawings.

#### Encasement

Provide concrete encasement to a part of the existing pipe and to new pipes outside the valve pit as shown in drawings. Surfaces of existing pipes shall be thoroughly wirebrushed and cleaned prior to placement of concrete.

#### Connections to existing structure/ pipe work

Connect the new pipeline to existing pipes using stainless steel mechanical couplings as shown in drawings. Concrete encase pipelines (outside the pits) including couplings after successful pressure testing.

## 6 RESTORATION WORKS

The disturbed area shall be restored as detailed below to a condition similar to the condition in which it was received, and to the satisfaction of the Principal's Representative.

The disturbed areas shall be compacted and graded to a suitable slope. The surface shall be free from vegetation, roots, large stones, clods etc, where applicable. Spread topsoil over the



area and to depth of 100mm on flat areas and 40-60mm on steep slopes. Topsoil shall be placed and trimmed to a uniform surface such that runoff is not concentrated and ponding does not occur.

Fertiliser (Starter 12/15) shall be applied evenly on the topsoil at a rate of 200kg/ha. Topsoil shall be loosened to a depth of 50mm immediately prior to application of fertiliser. Apply a suitable seed mixture evenly in all disturbed areas. Maintain the restored areas during the Defects Liability Period.

## **7 STRUCTURAL STEEL AND METALWORK**

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### **7.1 EXTENT OF WORKS**

This specification covers supply and fabrication of all structural steelwork, frames, lintels, gratings, roofing, access covers etc. including fabrication, corrosion protection, delivery to the site, storage and erection.

### **7.2 STANDARDS**

Structural steelwork and metalwork shall conform with the current relevant standards as follows: -

#### **Steel**

AS1163	Structural steel hollow sections
AS3678	Structural steel - hot rolled plates, floor plates and slabs
AS3679	Structural steel

#### **Electrodes**

AS1553	Covered electrodes for welding
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#### **Bolts**

AS1110	ISO metric hexagon precision bolts and screws
AS1111	ISO metric hexagon commercial bolts and screws
AS1112	ISO metric hexagon nuts, including thin nuts, slotted nuts and castle nuts
AS1237	Flat metal washers for general engineering purposes
AS1252	High strength structural steel bolts with associated nuts and washers for structural engineering
AS1214	Hot-dipped galvanised coatings on threaded fasteners

#### **Workmanship**

AS1554	Structural steel welding
AS4100	Steel structures
AS1665	Welding of aluminium structures

#### **Galvanising and Painting**

AS1627	Metal finishing - preparation and pre-treating of surfaces
AS3750	Paints for steel structures
AS4680	Hot-dipped galvanised coatings on fabricated ferrous articles.



## 7.3 MATERIALS

### Type of Steel

Type of Steel	Grade
Universal beams and columns, parallel flange channels, large angles to AS/NZS3679.1	300
Flat, small angles, taper flange beams and columns to AS/NZS3679.1	250
Welded sections to AS/NZS3679.2	300
Hot rolled plates, floor plates and slabs to AS/NZS3678	250
Hollow sections to AS1163: <ul style="list-style-type: none"><li>- Circular sections less than 265mm outside diameter</li><li>- Sections other than the above</li></ul>	250 350
Cold formed purlins and girts to AS1397	G450 Z350
Steel rails to AS1085.1	(one grade only)

### Aluminium

Use aluminium shapes and appurtenant materials from aluminium alloys known commercially as 5083 and 6061-T6.

### Stainless Steel

All stainless steel works shall be Grade 316 to AS/NZS4673. Use Grade 304 stainless steel nuts and washers and a lubricant with Grade 316 stainless steel bolts to avoid “seizing”.

## 7.4 WORKMANSHIP

### General

Neatly machine, saw or flame cut all edges of plates and members. Grind smooth all sharp, sheared and flame cut edges to a minimum radius of 3mm.

Remove all sharp corners and edges marred, cut or roughened in handling or erection by grinding or other approved means.

Do not heat stainless steel for purposes of bending, shaping or straightening.

Completed members shall be free from twists, bends and open joints. Sharp kinks or bends shall be cause for rejection.

### Finish

Give attention to finish of metalwork where exposed to view. Grind smooth welds of metalwork exposed to view.

### Site Cutting, Drilling and Welding

Do not cut, burn, drill or weld on site unless shown on the drawings or approved by the Principal's Representative.

## 7.5 WELDING

### Requirements

For weld categories not shown on the drawings use Category GP welds to AS/NZS1554.1. Use supervisors and welders who have suitable training and practical experience in the execution of this type of work.

Completed work shall be free from distortions and true to dimensions. Make due allowance for dimensional changes during welding.

All welds shall show a good even contour, a good penetration and fusion with the parent metal, and be without cracks, undercuts, overlaps, excessive slag inclusions and excessive porosity. Cut out unacceptable welds and re-weld.

## **7.6 BOLTS, NUTS, WASHERS AND JOINTING MATERIAL**

### **General**

All exposed boltheads and nuts shall be hexagonal. Bolt lengths shall be such that when fitted with a nut and tightened down, the threaded portion shall fill the nut and protrude from the face thereof by not more than half of the bolt diameter.

Place at least one washer under the bolt head or nut, whichever shall be rotated. Use taper washers where the part under the bolt head or nut is not perpendicular to the centreline of the bolt.

Provide single bolts used as a structural connection with a lock nut.

Smear threads of all bolts and nuts with graphite grease before assembly.

Do not use burred, damaged, corroded or otherwise unserviceable bolts and nuts.

### **Bolts in Shear**

No threaded portion of the bolts in shear shall be within the shear plane of the parts being joined.

### **Steel Bolts**

Use hot-dip galvanised bolts, nuts and washers unless otherwise specified.

### **Stainless Steel Bolts**

Bolt all aluminium members with stainless steel bolts. All stainless steel bolts shall be Grade 316. Use Grade 304 stainless steel nuts and washers and a lubricant to avoid 'seizing'.

### **Masonry Anchors**

Allowable types of fastenings are:

- cast in-situ bolts;
- chemical anchors in drilled holes; and
- expansion sleeve type anchors.

Install chemical and expanding sleeve anchors to manufacturer's instructions and/or recommendations.

Abandon and relocate drilled hole for chemical and expanding sleeved anchors if steel reinforcement is encountered. Thoroughly clean and fill abandoned drill holes with epoxy grout.

Stiffen or strengthen base plates and adjacent steelwork, as required, if relocating the masonry anchors necessitates alteration to steelwork base plates.

## **7.7 MARKING**

Mark with paint every separate member to show position and direction for easy identification and correct placing.

Attach loose pieces to their respective members.

Each type and size of bolt shall be stored in a separate metal tagged container.

## **7.8 BEDDING AND GROUTING**

Set up metalwork which is supported on concrete, masonry or like material on packing or wedges to facilitate alignment and permit subsequent grouting. Use either solid steel or

cement mortar blocks of similar strength to the permanent grout for permanent packing. Remove all other packing before completion of grouting. All grouting to comply with AS4100.

## **7.9 TRANSPORT, STORAGE AND ERECTION**

Load, transport and unload structural members without causing excessive stress, deformity or damage.

Carefully place, support and store all materials and structural members off the ground. Handle members carefully during erection so that the members are not injured or distorted. All connections shall be rigid and tight.

Use drifting only to bring parts into position, not to match unfair holes.

Securely fasten and temporarily brace all structures to keep stable during erection.

Temporary bracing shall be sufficient to withstand heavy winds, storms and construction loads.

## **7.10 CORROSION PROTECTION OF STEEL AND METALWORK**

### **General**

Protect steel generally by hot-dip galvanising except:

- where a decorative finish is required
- where items are too long to be hot-dip galvanised
- steelwork in aggressive environments, submerged or in contact with water or subject to splash or spray.

### **Hot-dip Galvanising**

Hot-dip galvanise all fabricated steel components (except stainless steel) after fabrication.

Prior to galvanising, clean the surfaces of all dirt, weld spatter, grease, slag, oil, paint or other deleterious matter. Chemically de-scale the steel surfaces or abrasive blast clean to Class 3 standard.

The zinc coating shall consist of a uniform layer of commercially pure zinc free of abrasions, cracks, chemical spots or other imperfections. The zinc coating shall adhere firmly to the surfaces of the steel.

Comply with WSS-TR20 and AS 4680. Minimum thickness of galvanising shall be:

- 600g/m<sup>2</sup> for steelwork 5mm thick or over
- 450g/m<sup>2</sup> for steelwork less than 5mm thick.

### **Defective Galvanised Coatings**

Rectify defective coating and repair damaged coatings as follows:

- Re-galvanise where the average zinc coating thickness is less than the minimum as specified. Average zinc coating thickness is the average of not less than 10 determinations over a test area of 1m<sup>2</sup>.
- Where the zinc coating has been damaged, repair the damaged surface by application of a zinc rich epoxy primer or an organic zinc rich 2 part epoxy paint to a minimum total dry film thickness of 100µm (minimum of 2 coats). Alternatively, use an approved low melting point zinc repair, such as BOC Commonweld Galvanising Bar, applied as recommended by its manufacturer.
- Overcoat all cold galvanised repairs with two coats of silver paint to blend the repairs with the undamaged colour of the hot dipped galvanised coating.

### **Ventilation Holes**

Drill ventilation holes to all enclosed hollow sections to be galvanised. Locate holes at points most suitable for draining off.

Seal holes after galvanising with lead plugs.

### **Aluminium**

Avoid direct contact between aluminium and dissimilar metals with PTFE gaskets, high strength phenolic washers, 2 coats of an approved zinc chromate paint or a heavy duty polyethylene tape.

Where bolts are used for attachment of aluminium members to steel, the bolts shall be provided with PTFE bushes and washers to ensure complete isolation.

Apply two heavy coats of an alkali resistant bituminous paint to aluminium surfaces if they are placed in contact with wood, concrete or masonry. Apply the paint as received from the manufacturer without the addition of any thinner.

### **Protection other than Hot-dip Galvanising**

Items too long to be galvanised may be protected in accordance with Clause 6.2 of WSS-TR20 subject to client approval of the finished appearance of the item and adjoining items. A consistent appearance for the structure will be required and may result in galvanisable items also being protected in accordance with Clause 6.2 of WSS-TR20.

Where a decorative finish is required or for steelwork in aggressive situations, protection shall be provided in accordance with WSS-TR20.

## **7.11 GRATE COVERS**

### **Valve Pit**

Provide lockable aluminium grating covers for the valve pit as shown in drawings. The cover shall consist of 6 gratings as shown in drawings. All gratings except the one above the access ladder shall be bolted. The grating above the ladder shall be hinged and provided with a locking arrangement.

The gratings could be fabricated by modifying standard grate covers (Webforge B325AP) to incorporate lifting handles, locking arrangement and hinges. Lifting handle(s) and locking arrangement shall be positioned within each grate cover in such a way that it would minimise the number of load bars to be cut.

If the Contractor intends to use alternative covers, the details of such alternative arrangements shall be submitted with the tender.

Once installed the covers shall not pose any trip hazards when walking. The opened position of the hinged grating (above the ladder) shall be safe and stable and it should not fall back suddenly.

### **Drainage Pits**

The 600 x 600 drainage pit shall have a removable aluminium grating of Load Class A (Webforge –MSG66A or equivalent).

The 1200 x 450 drainage pit near the V-Notch shall have a removable aluminium grating of Load Class A (Webforge –MTG45B or equivalent). Ensure necessary opening for overflow from the notch into the pit.

### **V-Notch**

Provide an aluminium grate cover (Webforge B325AP or equivalent) for V-Notch basin to enable obtaining flow measurements. The grating is expected to be approximately 1.2m x 0.8m and it shall rest on concrete blocks in the basin. Provide necessary opening to access the gauging pin. Provide handrails and kick boards around the grating as necessary.

## **7.12 ACCESS LADDERS, STAIRWAYS AND HANDRAILS**

### **Ladders inside pits**

Supply and install a galvanised steel access ladder in the valve pit as shown in drawings. The ladder shall be fabricated and installed in accordance with AS 1657 and other relevant standards. Alternative ladders such as GRP (Glass Reinforced Plastic) or FRN66 (Fibre Reinforced Nylon) ladders are also acceptable, however, details of these ladders shall be submitted with the tender submission.

Provide galvanised steel step irons for the 600x600 drainage pit in accordance with AS1657.

### **Stairways**

Hot dip galvanised access stairways (1.2m wide) shall be provided on either side of the pit as shown in drawings. The stairways shall be designed and constructed with necessary handrails in accordance with AS 1657 (Section 2 & 4) and clauses 7.1 to 7.10 of this sub section. The lower end of the stairway to V-Notch shall be fixed to concrete supports from the weir basin. Purpose of the weir basin is to collect seepage water from the hill side and overflow through the V-Notch and therefore concrete supports for grating and stairway shall not obstruct weir hydraulics.

### **Handrails**

Provide hot dip galvanised steel handrails (“Monowill” or equivalent) on top of the valve pit and along the access stairways, around the V-Notch basin grating as shown in drawings. The handrail around the grating on V-Notch basin should have kick boards. Handrails shall be manufactured and installed in accordance with AS 1657 and other relevant standards.

**END OF SUB SECTION 2 – CIVIL WORKS**

## **SECTION 3 – MECHANICAL REQUIREMENTS**

# Mechanical

## 8 EXTENT OF WORK

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The work covered in this Section of the specification includes the installation, testing, commissioning, demonstration and rectification of defects during the testing and Defect Liability of a gate valve, ball valve and pipe work, complete with all fittings & accessories as shown on the drawings.

The work covered in this section of the specification includes but is not limited to the following:

- Leakage rectification of the existing socket and spigot joint by caulking with lead.
- Removal of existing DN600 valve internals and installation of fabricated cover plate.
- Supply of valve spindle extension;
- Supply and install DN 50 Gate valves; and
- The site testing, demonstration and commissioning and the rectification of any defects, if necessary.

## 9 DECOMMISSIONING OF EXISTING VALVE PIT

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### 9.1 EXISTING INFRASTRUCTURE

The decommissioning of the existing valve pit will consist of the following:

- Caulking the socket and spigot joint with lead to suppress any leakage;
- Removal of the internals of the existing DN600 valve and installation of a fabricated steel cover plate.

After removal of the valve cover clean and prepare the surface to ensure an adequate seal is achieved with the new gasket and cover.

### 9.2 FABRICATED COVER PLATE

The plate shall be sized and manufactured to withstand the internal pressure in pipe as well as pressure of a mass concrete fill. The plate shall be manufactured of steel with thickness 25mm. The bolting arrangement shall be commensurate with the bolting pattern on top of the valve body. Stainless steel fasteners of suitable strength and length shall be used to adequately fix the new plate to the valve body.

A Neoprene rubber insertion gasket shall be supplied and cut to the correct dimensions on site. The gasket thickness shall be suitable to ensure a leak free seal is achieved under the maximum hydrostatic conditions created by the Dam.

The coating/surface protection for the plate shall comply with WS-SPEC SP40.

The hydrostatic testing of the installation shall be carried out before the existing pit is filled with concrete

## 10 DN 600 GATE VALVE

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The installation of the valve shall be in accordance with the WS-SPEC SP20, drawing No. 02430231-02 and the manufacturer's requirements and recommendations.



Supply 1 off valve spindle extension of suitable material and length for operation of the DN 600 gate valve from outside the pit. The length shall be appropriate to ensure operators can open and close the valve in accordance with OH & S requirements.

## **11 DN 50 RESILIENT SEATED GATE VALVES**

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### **11.1 GENERAL**

Supply and install 2 off DN 50 resilient seated flanged gate valves in accordance with the drawings.

The valves shall be supplied and tested in accordance with AS 2638, and shall include handwheels.

### **11.2 INSTALLATION**

The valves shall be installed within the new DN 600 valve pit in the location shown on drawing 02430231-02.

The valves shall be installed with spindle centre lines offset to ensure no interference between each valve handwheel during operation.

The valves shall be mounted on the flanged vertical DN 50 standpipe as shown on drawing 02430231-02.

The standpipe should be manufactured of steel and mounted on the DN 600 pipe with the addition of a welded saddle/compensating plate. The saddle shall be of thickness equivalent to the DN50 pipe wall thickness. All welds shall be carried out in accordance with AS 1579.

**END OF SECTION 3 - MECHANICAL**

## **SECTION 4 – TESTING, DEMONSTRATION AND COMMISSIONING REQUIREMENTS**

# Testing, Demonstration and Commissioning

## 12 OVERVIEW

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**Testing** is defined as tests by the Contractor prior to demonstration of the valve and equipment installed under this Contract. Testing includes both works testing and site testing.

**Demonstration** is the testing of the valve operation by the Contractor in the presence of the Principal's specialist personnel prior to Commissioning.

**Commissioning** is a one (1) day operating period by the Contractor of the equipment.

Provide all equipment, materials, labour, services, advice, instructions and other facilities necessary to test, demonstrate and commission and make the system comply with and operate in accordance with the Specification.

At least one week before testing is due to commence, furnish to the Principal in writing a detailed program for the testing of all equipment covered in this Contract. The program shall identify dates and duration proposed for site testing

At the end of the testing forward a report to the Principal confirming that all items on the program have been satisfactorily tested. This checklist shall be available to the Principal prior to the commencing of the demonstration by the Contractor.

## 13 SITE TESTING

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### 13.1 EQUIPMENT TESTING

Test all equipment supplied and installed under this Contract to ensure that the equipment supplied is operational and conforms to the requirements of the Specification. That is, all rubbish removed, all sumps, drains, services etc all finalised.

The test shall include but not limited to the following:

- The operation of all manually operated equipment.
- Hydrostatically test with actual working conditions against the dam head.

The hydrostatic test shall include:

- From the dam to the new DN600 gate valve;
- The section of pipe line downstream from the new DN600 gate valve to the existing DN300 valve.
- The Principal will provide a blanking plate with integral 100mm Ball valve for isolation of the Dam scour pipeline at the Dam end of the scour pipeline. The principal will also provide divers to install and remove the isolation plate.

The hydrostatic test is to be carried out by opening the 100mm valve on the blanking plate provided by the Principal, charging the scour pipeline. The opening of the valve is to be carried out by divers. The Principal will provide divers to open the 100mm valve for hydrostatic testing and to close it on completion of testing. Hydrostatic testing shall be a one day operation and the Principal will provide divers for this day. The contractor shall liaise with the Principal to arrange a suitable time period for testing.

**If remedial action is needed and the divers are required to visit site again for testing, in addition to the initial installation and final removal of the blanking plate, the costs for the divers will be borne by the contractor.**

## **13.2 PREPARATION FOR TESTING**

Undertake any necessary work by way of temporary connections, connection of instruments, cleaning of pipelines and equipment, safety measures and other preparations for carrying out testing in a workmanlike and expeditious manner before commencement of testing and made good or cleared away after completion of testing.

## **13.3 COMPLETION**

At the end of the Contractor's site testing program, prepare a report and submit to the Principal confirming that all items have been satisfactorily tested. This report shall be fully comprehensive and provide details to prove that all equipment is in accordance with the specified requirements.

## **14 DEMONSTRATION**

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The Principal will then arrange within five (5) working days for specialist personnel to be on site. Demonstrate to these personnel the satisfactory conformity of the equipment to all clauses of the specification. In the event that all equipment cannot be demonstrated to operate satisfactorily and in accordance with the Contract during a period of up to two working days, then the Contractor shall reimburse the Principal the cost of having the specialist personnel on site.

Work during the demonstration shall include but not be restricted to the following (apply items only relevant to this scheme):

- Inspecting the installation and testing of all the equipment to ensure compliance with the Specification and Contract Drawings
- Inspection of drainage works
- Safety equipment/requirements
- Operation of the DN 600 gate valve
- Operation of the DN 50 gate valves
- Water tightness or water retaining pipes and structures
- Stairway, walkway and platform to Work Cover Authority requirements
- Pipe work arrangements

## **15 COMMISSIONING**

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### **15.1 SCOPE**

After successful completion of tests and Demonstration to the Principal's specialist personnel, Commissioning of the installation of the Scour Valve shall then be carried out.

The Work required during the Commissioning includes but shall not necessarily be limited to:

- 1) Opening and closing of the installed valves.
- 2) Revisions to Drawings as and if required.
- 3) Work and items associated with or incidental to the above.

### **15.2 DURATION OF COMMISSIONING**

Commissioning shall be deemed complete when the whole of the Works has been run continually without any faults for one day (excluding Public Holidays, Saturdays and Sundays).

If during this period any of the any mechanical equipment does not operate as specified then the allocated one (1) day shall be recommenced for a further one (1) day after the necessary rectification work has been completed:

### **15.3 CONTRACTOR'S PERSONNEL**

During the period of site Testing, Demonstration and Commissioning, the Contractor shall have on site technical personnel who are specialist in the operation of the valves and various equipments.

## **16 POST COMPLETION INSPECTIONS**

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Include for an inspection by experienced personnel familiar with the contract and operation of this scheme accompanied by the Principal during the eleventh (11) months after completion.

During the inspection, performance check of the Scour Valve works shall be carried out by the Contractor in the presence of specialist personnel of the Principal.

**END OF SECTION 4- TESTING, COMMISSIONING AND DEMONSTRATION**

## **SECTION 5 – DRAWINGS**



Drawing No. 02430231-01 Rev B – PROPOSED WORKS – LAYOUT PLAN

Drawing No. 02430231-02 Rev B – VALVE PIT – PLAN & SECTIONS

Drawing No. 02430231-03 Rev B – DRAINAGE AND V-NOTCH WEIR

Drawing No. 02430231-04 Rev B – PIT LADDER DETAILS

Drawing No. 02430231-05 Rev B – PIT COVER DETAILS

Drawing No. 02430231-06 Rev B – THRUST FLANGE AND WELDED COLLAR DETAILS