Standard

Engineering Competency Standard

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Revision details

Version No.	Clause	Description of revision
5	All Clauses	• Substantial changes, amendments and additional clarifications included in all clauses. • Additional sub-categories included in the competency requirements tables to provide more clarity.
4	All Clauses	• All clause numbers and wording updated to provide more clarity. • No significant changes to competency requirements; except for electrical engineering discipline. • Additional clarifications included in all clauses. • Additional sub-categories included in the competency requirements tables to provide more clarity. • Competency category table has been removed and more details added under competency requirements of each engineering discipline, to avoid repetition. • Requirement for Independent Verification certificate included together with template Appendix B. • Electrical engineering categories of design work have been expanded to acknowledge the different skill levels and experience that are required for each activity. • The minimum qualifications and experience classifications for electrical engineering have been updated to reflect the changes to the categories of work.
3	Clauses 6 & 7	• Clarifications added to roles and responsibilities, • Geotechnical competency requirements and structural competency requirements
2	All Clauses	Minor Amendments
1	-	First Issue

Foreword

This Standard is for the design, supply, construction and protection of Sydney Water assets.

Sydney Water makes no warranties, express or implied, that compliance with the contents of this Standard shall be sufficient to ensure safe systems of work or operation.

It is the user's sole responsibility to ensure that the copy of the Standard is the current version as in use by Sydney Water.

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Acronyms

Acronym	Definition
CPEng	Chartered Professional Engineer registration with Engineers Australia
ETS	Engineering and Technical Support, Water & Environment Services, Sydney Water
NER	National Engineering Register, Australia
SME	Subject Matter Expert
SQIDS	Stormwater quality improvement devices
WSUD	Water Sensitive Urban Design

General terms & definitions

Term	Definition
Comparable jobs	A successful past project with an equivalent level of design complexity and risk, including all investigation analysis and design activities. Large projects may comprise a number of similar components that require different levels of skill, knowledge and experience. For example, a project may include three distinctly separate pipes i.e. a DN200 pressure pipe, DN750 gravity main and a DN1500 pressure pipe. Although one project, these pipes are distinctly separate and different in nature and may be presented separately as experience for each discipline category.
Competence	The ability to apply knowledge and skills to achieve intended results.
Competency Level 1	Limited experience and knowledge; requiring guidance and supervision. Typically focused on learning basic concepts and skills.
Competency Level 2	Developing skills and knowledge; gaining more independence. Can handle more complex tasks with less supervision.
Competency Level 3	Sound experience and knowledge; able to work independently and perform duties requiring the application of mature professional engineering knowledge. Can solve complex problems and provide guidance to less experienced engineers.
Competency Level 4	Extensive experience and knowledge; recognized as an authority in the field. Can tackle the most challenging problems and innovate new solutions.
Complying Section 73 Developer works	Minor developer works, with low-risk rating as per Work Instruction “Processing a Complying Application Package for a Section 73 Certificate”
Design (verb)	The process of converting defined project objectives into design documentation ready for asset procurement. Design covers concept design and detail design development.
Design (noun)	The product of the process of designing that typically includes drawings and specifications describing the solution (conceptual or detailed) of the system or system elements. In Sydney Water’s context it also includes reports and data sets produced in investigation activities undertaken during design such as engineering appraisal, survey and geotechnical investigations.
Design personnel	Those involved in the design process making decisions affecting the design and includes designers, verifiers, independent verifiers, design managers and others that provide information and recommendations on which designs are based.
May	Indicates the existence of an option.
Must	Indicates that a statement is mandatory.

1. General

1.1 Introduction

Sydney Water relies on professional engineers providing services to create, maintain and operate Sydney Water's assets. To optimize public value, Sydney Water requires engineers providing engineering design services to be appropriately competent. This will ensure assets are designed to achieve planned outcomes and are fit for purpose.

1.2 Scope

This standard provides the requirements for assessing a person's competence to carry out specific engineering tasks for design and protection of Sydney Water's infrastructure assets and associated works.

The requirements of this standard apply to all personnel involved in the design of Sydney Water assets, regardless of whether they are directly employed by Sydney Water or not.

In this standard, design also includes all investigation activities and analysis undertaken during the design process, e.g., material testing, hydraulic studies, condition assessment, geotechnical investigations, etc. Design also includes all investigation activities undertaken in preparation of a specialist engineering assessment for asset protection.

Personnel responsible for making design decisions on or about Sydney Water infrastructure are regarded as designers and must have their engineering competencies assessed.

This standard does not apply to Complying-Section 73 developer works.

1.3 Purpose

The engineering competencies defined in this standard have been developed to achieve Sydney Water's requirements under both the *Sydney Water Act* and the *Operating Licence*.

The *Sydney Water Act* sets objectives for Sydney Water to:

- provide, construct, operate, manage and maintain efficient, co-ordinated and commercially viable systems and services
- operate at least as efficiently as any comparable businesses
- ensure that the systems and services meet the quality and performance standards specified in the *Operating Licence*.

In addition to these, Sydney Water's *Operating Licence* requires that Sydney Water develops and maintains both:

- an Asset Management System that is consistent with AS ISO 55001
- a Quality Management System that is consistent with AS/NZS ISO 9001.

To achieve the requirements of these systems, Sydney Water must determine the necessary competence of persons doing work that affects its asset performance. Similar requirements are also reflected in Sydney Water's *Asset Management Policy* and *Asset Creation Policy*.

In addition to compliance drivers, defining the competence of designers that undertake work on Sydney Water's assets is crucial to ensure that they are designed to achieve planned outcomes and are fit for purpose. This significantly contributes to meeting the objectives outlined in the *Sydney Water Act*.

1.4 Statutory obligations

Requirements specified herein must not be used to reduce nor remove any obligations the design organisation or personnel have as required by the appropriate regulations.

All works must comply with the requirements of all federal and state laws and legislations in force in New South Wales. Where the works are subject to the control of statutory or regulatory authorities, the works must comply with the requirements of the authorities.

1.5 Reference

Document type	Title	Document reference
Compliance obligations	AS/NZS ISO 9001 Quality management systems – Requirements	Whole document
	AS ISO 55001 Asset management – Management systems – Requirements	Whole document
Policies and procedures	Sydney Water's *Asset Management Policy*	Whole document
	Sydney Water's *Asset Creation Policy*	Whole document
Other Documents	Sydney Water *Management Specification*	Section 4

2. Roles and responsibilities

2.1 Sydney Water's subject matter experts

Sydney Water's subject matter experts (SMEs) referenced in this standard are Sydney Water's lead engineers for each engineering discipline in the Engineering Modernisation team within Engineering & Technical Support (ETS) as listed in Table 1.

Table 1 - Sydney Water's subject matter experts

Engineering discipline	Subject matter expert
Civil engineering Dam safety	Technical Director – Civil engineering or Principal civil engineer
Structural engineering	Technical Director – Structural engineering or Principal structural engineer
Geotechnical engineering	Technical Director – Geotechnical engineering or principal geotechnical engineer
Mechanical engineering	Technical Director – Mechanical engineering or Principal mechanical engineer
Hydraulic engineering	Technical Director – Civil engineering or Principal civil engineer
Electrical engineering Instrumentation and control	Technical Director – Electrical engineering
Building services engineering	Technical Director – Mechanical engineering or Principal mechanical engineer
Treatment process engineering	Technical Director – Process engineering
Stormwater & WSUD	Technical Director – Civil engineering or Principal civil engineer

Sydney Water's SMEs, for their respective engineering disciplines, must:

- determine required competencies and levels applicable to discipline specific engineering tasks listed in this standard
- assist project managers and case managers where required, to review and accept or reject allocation of competencies to design personnel
- exercise authority to reduce or withdraw competence levels assigned to internal or external design personnel when performance falls short of expected levels of performance.

2.2 Project manager

All personnel referenced in this clause are Sydney Water personnel, with nominated authority to act on behalf of Sydney Water.

In the course of delivering projects, the project manager (or case manager) must:

- review and accept or reject allocation of competencies to design personnel as suitable for the category of work being undertaken
- seek appropriate advice from Sydney Water's SMEs in the review of design personnel competency
- ensure competency assessment records are kept for design personnel.

2.3 Design manager

The design manager referenced in this standard is a person who manages all the processes in relation to producing a design for an organisation engaged to prepare a design. The nominated design manager must have had significant design management experience on at least three comparable projects and have at least level 2 competency in the critical portion of the work as determined by Sydney Water.

The design manager must:

- plan and coordinate the delivery of the overall design
- allocate competent resources for all categories of design work
- provide evidence of all design personnel to the project manager or case manager, prior to commencing any design work, using the evidence of competency form in Appendix A
- manage multi-discipline design teams, where appropriate
- verify that the engineering design organisation responsible for producing the design has a quality management system in place that is independently certified to AS/NZS ISO 9001.
- collect all evidence for verification and independent verification and present to Sydney Water, when requested
- certify the overall design as being fit for purpose and meeting Sydney Water's requirements on behalf of the organisation engaged to undertake the design.

2.4 Designer

The designer referenced in this standard is a person responsible for a category of design work for an organisation engaged to prepare a design. The designer must be the discipline design lead and may use multiple engineering personnel to assist in developing the design. The designer must not be the verifier.

The designer must:

- gather evidence of competency for the role or task they will perform. The designer may gain experience for a higher level of competency by undertaking more complex design activities under direct supervision of a more senior designer (i.e. a designer with a higher level of competency)
- provide evidence of relevant competency to the design manager, prior to commencing any design work. Such evidence must be relevant and provide adequate details to be verified.
- carry out engineering tasks within the limitations imposed by assessed level of competency and for the intended purposes
- keep up to date with advances and changes in their area of expertise.

2.5 Verifier

The verifier referenced in this standard is a person responsible for the verification of the technical quality of engineering tasks carried out by the designer.

Design verifiers must:

- gather evidence of competency for the role or task they will perform, prior to commencing any verification work
- provide evidence of relevant competency to the design manager, prior to commencing any design verification work

- oversee engineering tasks within the limitations imposed by assessed level of competency
- verify designs as being fit for purpose and meeting Sydney Water's requirements within the limitations imposed by assessed level of competency.
- verify designs as being in accordance with Sydney Water Safety in Design procedures.

2.6 Independent verifier

An independent verifier is a person or a team of verifiers, independent of the organisation that carries out the design and verification.

Independent verification is a risk control measure and as such must be employed in situations which are complex and attract considerable risk. Large, high value projects would benefit from independent verification as would small (or large) complex projects with high-risk components. In situations where an independent verification is nominated by this standard but not deemed necessary, the designer should submit a Deviation from Standard for Sydney Water's approval. Sydney Water's Enterprise Risk Matrix should be used to determine the level of risk.

Independent design verifiers must:

- gather evidence of competence for the role or task they will perform, prior to commencing any independent verification work
- carry out a comprehensive examination of all aspects of the designs
- carry out analytical and design calculations that are independent of that of the designer and without exchange of calculation sheets or similar information with the designer
- verify the calculations are translated accurately into the design details and drawings, specification clauses or assessed capacities
- verify the applicability and accuracy of all computer programs used in the check and must ensure the validity of the program for each application
- not await the completion of the design, to start the verification. Both activities may proceed in parallel as far as is practicable
- prepare an independent verification report documenting outcomes of the independent verification and present to Sydney Water
- independently certify each category of design work requiring independent verification as meeting Sydney Water's requirements using the certificate template in Appendix B and submit to Sydney Water.

3. Competency requirements

3.1 Overview

The Sydney Water SME as per Table 1 for each engineering discipline determines the design competencies required for various aspects of design pertinent to their respective engineering discipline.

Competencies are made up of:

- qualifications or units of competence recognised by the Australian Qualification Framework (AQF). These include qualifications issued by universities, TAFE, schools and other registered training organisations
- knowledge and skills
- experience in the specific engineering task listed.

Where professional qualification such as memberships of Engineers Australia are nominated, equivalent qualifications of other professional bodies who have reciprocal arrangements with Engineers Australia are also be acceptable.

A designer that does not meet the required competency level for a sub-category of design work may undertake the design provided they are under the direct supervision of competent design personnel.

Direct supervision involves the supervisor directing, guiding, overseeing, and evaluating the supervisee's work. The supervisor must also take full professional responsibility for the design work. Supervision does not eliminate the need for design verification.

Design work completed under direct supervision can be used to demonstrate experience when assessing competency levels.

For a description of the different competency levels 1 – 4, refer to General terms & definitions.

3.2 Category of design work

The specific requirements for each category of design work and associated minimum qualifications and experience required, are defined in Tables 2 to 22.

Where a particular design task is not listed in the standard, competency requirements for such work category must be agreed with the responsible SME as per Table 1.

For specialist engineering assessments, the appropriate design category applies to the existing Sydney Water asset and not the external works being designed.

3.3 Engagement of professional engineers

Competent designers, verifiers and independent verifiers must be engaged for each relevant work category.

Depending on complexity, some categories of design work may require input from multiple engineering disciplines. For example, mechanical, electrical, civil, structural, geotechnical, hydraulics and other engineering disciplines may be involved in design of pumping stations.

Inputs from various disciplines must be coordinated by the design manager.

3.4 Civil engineering competency requirements

Civil engineering competency requirements depending on sub-category of design work, are provided in Table 2.

Table 2 - Civil engineering competency requirements

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Pipelines - Minor	Buried sewer reticulation pipes ≤ DN300 and < 6 m in depth where covered by prescriptive standards	C1	C2	Not required
	Buried water reticulation pipes and sewer pressure mains ≤ DN300 where covered by prescriptive standards	C1	C2	Not required
Pipelines - Medium	Buried water/sewer/stormwater pipes DN375-DN750 at depth ≤ 15 m	C2	C3	Not required
	Pipes ≤ DN300 and design pressure > 120 m	C2	C3	Not required
	Trenchless installations ≤ DN300 (eg Horizontal directional drilling, micro-tunnelling etc)	C2	C3	Not required
	Pipes in mine subsidence areas ≤ DN300	C2	C3	Not required
	Reticulation sewers in basements ≤ DN300	C2	C3	Not required
	Aqueducts ≤ DN300	C2	C3	Not required
	Pipes ≤ DN300 in soft or compressible soils prone to significant settlement and/or instability	C2	C3	Not required
	Pipes in contaminated ground ≤ DN300	C2	C3	Not required
	Pipes ≤ DN300 at depth 6-15 m	C2	C3	Not required
Pipelines - Major	Buried water/sewer/stormwater pipes DN750-DN1200 at depth ≤ 15 m	C3	C4	C4 (Note 1)
	Pipes DN375-DN750 and design pressure > 120 m	C3	C4	C4 (Note 1)
	Pipes in mine subsidence areas DN375-DN750	C3	C4	C4 (Note 1)
	Trenchless installations DN375-DN750 (e.g. Horizontal directional drilling, micro-tunnelling etc)	C3	C4	C4 (Note 1)
	Aqueducts DN375-DN750	C3	C4	C4 (Note 1)

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
	Pipes DN375-DN750 soft or compressible soils prone to significant settlement and/ or instability	C3	C4	C4 (Note 1)
	Pipes in contaminated ground DN375-DN750	C3	C4	C4 (Note 1)
Pipelines - Complex	Buried water/sewer/stormwater pipes > DN1200 at depth ≤ 15 m	C3	C4	C4
	Pipes > DN750 and design pressure > 120 m	C3	C4	C4
	Pipes in mine subsidence areas > DN750	C3	C4	C4
	Trenchless installations > DN750 (e.g. Horizontal directional drilling, micro-tunnelling etc)	C3	C4	C4
	Aqueducts > DN750	C3	C4	C4
	Pipes > DN750 in soft or compressible soils prone to significant settlement and/ or instability	C3	C4	C4
	Pipes in contaminated ground > DN750	C3	C4	C4
	Pipes at depth > 15m	C3	C4	C4
General civil	Minor access roads (< 10% slope) to/within network and treatment facilities	C2	C3	Not required
	Major access roads (> 10% slope) to/within network and treatment facilities	C3	C4	Not required
	Complex access roads to/within network and treatment facilities (e.g. in soft or compressible soils prone to significant settlement and/or subject to instability)	C3	C4	C4
Engineering assessment of existing pipelines (e.g. for preparation of specialist engineering assessments)	Investigation, condition assessment, structural appraisal and rehabilitation of existing intact minor pipelines, or minor pipelines laid from 1980 onwards	C1 or S1	C2 or S2	Not required
	Investigation, condition assessment, structural appraisal and rehabilitation of existing deteriorated minor pipelines laid before 1980	C2 or S2	C3 or S3	Not required
	Investigation, condition assessment, structural appraisal and rehabilitation of existing intact medium pipelines, or medium pipelines laid from 1980 onwards	C2 or S2	C3 or S3	Not required

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
	Investigation, condition assessment, structural appraisal and rehabilitation of existing detriorated medium pipelines laid before 1980	C3 or S3	C4 or S4	C4 or S4 (Note 1)
	Investigation, condition assessment, structural appraisal and rehabilitation of existing intact major pipelines, or major pipelines laid from 1980 onwards	C3 or S3	C4 or S4	C4 or S4 (Note 1)
	Investigation, condition assessment, structural appraisal and rehabilitation of existing deteriorated major pipelines laid before 1980	C3 or S3	C4 or S4	C4 or S4
	Investigation, condition assessment, structural appraisal and rehabilitation of existing complex pipelines	C3 or S3	C4 or S4	C4 or S4

Note 1: Independent verification may be required where very high risks have been identified through project specific risk assessment. Need for independent verification is to be confirmed by Sydney Water.

Table 3 - Minimum qualifications and experience for civil engineering

Classification	Minimum Academic Qualification	Minimum Professional Qualification	Minimum years of relevant experience	Minimum number of specific, comparable jobs
C1	Diploma of civil engineering, diploma of civil construction design, diploma of surveying or equivalent, or	Not required	2	5
	Equivalent professional experience (Note 1)	N/A	5	15
C2	Bachelor's degree in civil engineering or environmental engineering	Not required	5	3
C3	Bachelor's degree in civil engineering or environmental engineering	CPEng & NER (Civil)	7	4
C4	Bachelor's degree in civil engineering or environmental engineering	CPEng & NER (Civil)	10	5

Note 1: In lieu of a formal academic qualification, competency level C1 may be achieved where the designer is deemed by Sydney Water to have obtained equivalent professional experience.

3.5 Structural engineering competency requirements

Table 4 - Structural engineering competency requirements

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Minor structures	Reinforced concrete, steel and masonry buildings Height ≤ 4 m and footprint ≤ 100 m^2	S1	S2	Not required
	Reinforced concrete and steel in/on ground tanks, chambers etc Depth ≤ 4 m and footprint ≤ 200 m^2	S1	S2	Not required
	Reinforced concrete pump station wells Depth ≤ 6 m and dia ≤ 3 m	S1	S2	Not required
	Reinforced concrete access shafts Depth ≤ 6 m	S1	S2	Not required
	Reinforced concrete culverts Span ≤2 m	S1	S2	Not required
	Reinforced masonry and reinforced concrete retaining walls Height ≤ 3 m	S1	S2	Not required
	Metal access hatches Footprint ≤ 3 m^2	S1	S2	Not required
	Metal ladders, stairs and stair towers Height ≤ 12 m	S1	S2	Not required
	Steel ventshafts, barometric loop structures and other similar structures Height ≤ 9 m	S1	S2	Not required
	Stop boards and bulk heads Depth ≤ 3 m and span ≤ 3 m	S1	S2	Not required
Medium Structures	Reinforced concrete, steel and masonry buildings and equipment floors 4m < Height ≤ 6 m and	S2	S3	Not required

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
	100 m^2 < Footprint ≤ 200 m^2			
	Reinforced concrete and steel in/on ground tanks, chambers etc 4m < Height ≤ 6 m and 200 m^2 < Footprint ≤ 600 m^2	S2	S3	Not required
	Reinforced concrete and steel elevated tanks Total height ≤ 12 m and Footprint ≤ 125 m^2	S2	S3	Not required
	Reinforced concrete pump station wells 6m < Depth ≤ 12 m and 3m < Diameter ≤ 6 m	S2	S3	Not required
	Reinforced concrete access shafts 6m < Depth ≤ 12 m	S2	S3	Not required
	Plain concrete access shafts Depth ≤ 6 m	S2	S3	Not required
	Reinforced concrete culverts 2m < Span ≤ 4m	S2	S3	Not required
	Simply supported span road bridges, pipe bridges and aqueducts Span ≤ 20 m	S2	S3	Not required
	Reinforced concrete retaining walls 3m < Height ≤ 6 m	S2	S3	Not required
	Plain concrete and masonry retaining walls Height ≤ 3 m	S2	S3	Not required
	Metal access hatches 3m^2 < Footprint ≤ 8 m^2	S2	S3	Not required
	Metal ladders, stairs and stair towers 12m < Height ≤ 18m	S2	S3	Not required
	Steel venstshafts, barometric loop structures and other similar structures 9m < Height ≤ 18m	S2	S3	Not required

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
	Reinforced concrete ventshafts Height ≤ 18 m	S2	S3	Not required
	Plain concrete and masonry ventshafts Height ≤ 9m	S2	S3	Not required
	Stop boards and bulkheads 3m < Depth ≤ 6m and 3m < Span ≤ 6m	S2	S3	Not required
Major structures	Reinforced concrete, steel and masonry buildings, and equipment floors Height > 6 m and/or footprint > 200 m^2	S3	S4	S4 (Note 1)
	Reinforced concrete and steel in/on ground tanks, and chambers Height > 6 m and/or footprint > 600 m^2	S3	S4	S4 (Note 1)
	Reinforced concrete and steel elevated tanks 12m < Height ≤ 18m and 125 m^2 Footprint ≤ 250 m^2	S3	S4	S4 (Note 1)
	Reinforced concrete pump wet wells Depth > 12 m and/or Dia >6 m	S3	S4	S4 (Note 1)
	Reinforced concrete access shafts Depth > 12 m	S3	S4	S4 (Note 1)
	Plain concrete access shafts Depth > 6 m	S3	S4	S4 (Note 1)
	Simply supported and continuous span steel and reinforced concrete road bridges, aqueducts and pipe bridges 20 m < Span ≤ 40 m	S3	S4	S4 (Note 1)
	Simply supported prestressed concrete bridges 20 m < Span ≤ 40 m	S3	S4	S4 (Note 1)
	Reinforced concrete retaining walls Height > 6 m	S3	S4	S4 (Note 1)
	Plain concrete and masonry retaining walls.	S3	S4	S4 (Note 1)

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
	Height > 3 m			
	Metal ladders, stairs and stair towers Height > 18 m	S3	S4	S4 (Note 1)
	Steel ventshafts, steel barometric loop structures and other similar structures Height > 18 m	S3	S4	S4 (Note 1)
	Reinforced concrete ventshafts Height > 18 m	S3	S4	S4 (Note 1)
	Plain concrete and masonry ventshafts 9m < Height ≤ 18m	S3	S4	S4 (Note 1)
	Stopboards and bulkhead Depth > 6m and/or span > 6 m	S3	S4	S4 (Note 1)
Complex structures	Prestressed concrete liquid holding tanks	S3	S4	S4
	Plain concrete and masonry ventshafts > 18 m	S3	S4	S4
	Reinforced concrete and steel elevated liquid holding tanks Height > 18 m and/or footprint > 250 m^2	S3	S4	S4
	Prestressed concrete continuous span road bridges, pipe bridges and aqueducts	S3	S4	S4
	Concrete Dams	S3	S4	S4
Engineering Assessment of existing structures	Investigation, condition assessment, structural appraisal and rehabilitation of existing minor structures	S1	S2	Not required
	Investigation, condition assessment, structural appraisal and rehabilitation of existing medium structures	S2	S3	Not required
	Investigation, condition assessment, structural appraisal and rehabilitation of existing major structures	S3	S4	S4 (Note 1)
	Investigation, condition assessment, structural appraisal and rehabilitation of existing of complex structures	S3	S4	S4

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
	Investigation, condition assessment, structural appraisal and rehabilitation of:			
	• Plain concrete and masonry circular linear assets subjected to ovalisation and/or curvature in long or transverse direction. Maximum Internal diameter ≤ 1200 mm	S3	S4	S4 (Note 1)
	• Plain concrete and masonry oviform linear assets. Maximum internal dimension ≤ 800 mm	S3	S4	S4 (Note 1)
	• Plain concrete and masonry linear assets with arch roof. Maximum internal dimension ≤ 800 mm	S3	S4	S4 (Note 1)
	• Plain concrete and masonry rectangular linear assets. Maximum internal dimension ≤ 1500 mm	S3	S4	S4 (Note 1)
	Investigation, condition assessment, structural appraisal and rehabilitation of:			
	• Plain concrete and masonry circular linear assets subjected to ovalisation and/or curvature in long or transverse direction. Maximum Internal diameter > 1200 mm	S3	S4	S4
	• Plain concrete and masonry oviform linear assets. Maximum internal dimension > 800 mm	S3	S4	S4
	• Plain concrete and masonry linear assets with arch roof. Maximum internal dimension > 800 mm	S3	S4	S4
	• Plain concrete and masonry rectangular linear assets. Maximum internal dimension > 1500 mm	S3	S4	S4

Note 1: If required based on project specific risk assessment, to be determined by Sydney Water responsible SME (Table 1) or project manager.

Table 5 - Minimum qualifications and relevant experience for structural engineering

Classification	Minimum academic qualification	Minimum professional qualification	Minimum years of relevant experience	Minimum number of specific, comparable jobs
S1	Bachelor's degree in civil or structural engineering	Not required	2	2
S2	Bachelor's degree in civil or structural engineering	Not required	5	3
S3	Bachelor's degree in civil or structural engineering	CPEng & NER (Structural)	7	4
S4	Bachelor's degree in civil or structural engineering	CPEng & NER (Structural)	10	5

3.6 Geotechnical engineering competency requirements

Table 6 - Geotechnical engineering competency requirements

Category of design work (Note 1 &2)	Sub-categories and description of design element or works (Note 3)	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Geotechnical investigations – Fieldwork & factual reporting – Simple geology	Geotechnical investigation logging on site and factual reporting of investigation logs for sites with simple and reasonably uniform geology	G1	G3	Not required
Geotechnical – Fieldwork & factual reporting – Complex geology	Geotechnical site walkovers, identifying high risk areas, geological mapping and logging excavated material for sites with complex or highly variable ground conditions	G3	G4	Not required
Geotechnical investigation scoping, interpretation and design input for minor structures or minor/medium pipelines in simple geology	Scoping and managing geotechnical investigations for minor structures or minor pipelines or medium pipelines in simple geology	G1	G3	Not required
	Geotechnical interpretation and geotechnical design inputs for minor structures or minor pipelines or medium pipelines in simple geology	G1	G3	Not required
	Geotechnical interpretation and geotechnical design inputs for earth retaining structures ≤ 3 m in simple geology	G1	G3	Not required
	Geotechnical interpretation and geotechnical design inputs for fill embankments or cut slopes with effective retained height ≤ 3 m in simple geology	G1	G3	Not required
	Geotechnical interpretation and geotechnical design inputs for general civil works in simple geology	G1	G3	Not required
Geotechnical investigation scoping, interpretation and design input for medium structures and major pipelines in simple geology	Geotechnical inputs for reinforced concrete box culverts in simple geology	G2	G4	Not required
	Geotechnical inputs for inground tanks with < 6 m effective depth in simple geology	G2	G4	Not required
	Geotechnical inputs for earth retaining structures, excavation, fill embankments and cut slopes with effective retained height ≥ 3 m and < 6 m in simple geology	G2	G4	Not required

Category of design work (Note 1 &2)	Sub-categories and description of design element or works (Note 3)	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
	Geotechnical inputs for pipes laid in trenches and have diameter > 750 mm and less than 1200 mm dia. in simple geology	G2	G4	Not required
	Geotechnical inputs for pipes tunnelled and with outer bore diameter < 750 mm in simple geology	G2	G4	Not required
Tunnels – Condition assessment	Rock tunnels condition assessment	G2	G3	Not required
Geotechnical investigation scoping, geotechnical interpretation and design input of major structures and complex pipelines in simple geology	Geotechnical inputs for inground tanks with > 6 m depth in simple geology	G3	G4	G4 (Note 4)
	Geotechnical inputs for foundations for above ground water retaining structures in simple geology	G3	G4	G4 (Note 4)
	Geotechnical inputs for stability risk assessments on existing assets in simple geology	G3	G4	G4 (Note 4)
	Geotechnical inputs for pipelines ≥ 1200 mm dia., laid in trenches in simple geology	G3	G4	G4 (Note 4)
	Geotechnical inputs for pipes tunnelled and with outer bore diameter of > 750 mm and less than 1200 mm dia. in simple geology	G3	G4	G4 (Note 4)
	Geotechnical inputs for project sites with Bringelly Shale and existing natural slopes steeper than 3:1 (horizontal to vertical)	G3	G4	G4 (Note 4)
	Geotechnical inputs for fill embankments and cut slopes with effective retained height ≥ 6 m in simple geology	G3	G4	G4 (Note 4)
Complex works – Scoping geotechnical investigations, geotechnical interpretation and geotechnical design inputs	Geotechnical design checks of retaining walls with effective retained height ≥ 6 m	G3	G4	G4
	Ground improvement design	G3	G4	G4
	Geotechnical design of bridge foundations and abutments	G3	G4	G4
	Projects in sites with soft or compressible soils prone to significant settlement and/or instability	G3	G4	G4
	Projects in sites with ground conditions prone to slope instability or landslide	G3	G4	G4

Category of design work (Note 1 &2)	Sub-categories and description of design element or works (Note 3)	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Complex works – Scoping geotechnical investigations, geotechnical interpretation and geotechnical design inputs…cont.	Projects in landfill sites or sites with significant uncontrolled fill	G3	G4	G4
	Geotechnical design inputs for tunnelled pipelines with outer bore diameter >1200 mm dia.	G3	G4	G4
	Geotechnical inputs for analysis and design of tunnels and underground caverns, including support design	G3	G4	G4
	Geotechnical design inputs for project sites subjected to mine-subsidence	G3	G4	G4
	Geotechnical inputs for elevated or liquid holding tanks classified as declared dams, as per NSW Dam Safety Act or Regulation	G3	G4	G4
Geotechnical assessment and modelling of impact on existing assets	Geotechnical inputs, modelling and assessment of movements for minor structures or minor pipelines	G2	G3	Not required
	Geotechnical inputs, modelling and assessment of movements for medium structures or medium pipelines	G3	G4	G4 (Note 4)
	Geotechnical inputs, modelling and assessment of movements for major structures or major pipelines	G3	G4	G4 (Note 4)
	Geotechnical inputs, modelling and assessment of movements for complex structures or complex pipelines	G3	G4	G4

Note 1: Simple geology = fairly uniform geology expected within site and ground conditions are expected to be pose low risk to assets proposed.
Note 2: Complex geology = geology/ ground conditions expected to vary within site or expected to have significant impact to proposed assets.
Note 3: Refer Tables 2 & 4 for definition of works covered under minor, medium, major, complex structures or pipelines and general civil works.
Note 4: If required based on project specific risk assessment, to be determined by Sydney Water responsible SME (Table 1) or project manager.

Table 7 - Minimum qualifications and relevant experience for geotechnical engineering

Classification	Minimum academic qualification	Minimum professional qualification	Minimum years of specific, relevant experience	Minimum number of comparable jobs
G1	Bachelor's degree in civil or	Not required	2	2
	Bachelor's degree in engineering geology	Not required	5 (1) (Note 1)	2
G2	Bachelor's degree in civil or	Not required	5	5
	Bachelor's degree in engineering geology	Not required	7 (3) (Note 1)	5 (2) (Note 1)
G3	Bachelor's degree in civil or	CPEng & NER (Civil - Geotechnical) or	7	7
	Bachelor's degree in engineering geology	RPGeo (Geotechnical)	10	7
G4	Bachelor's degree in civil or	CPEng & NER (Civil - Geotechnical) or	10	10
	Bachelor's degree in engineering geology	RPGeo (Geotechnical)	15	10

Note 1: Number of years and number of projects in brackets are only relevant for Geotechnical Investigation Fieldwork

3.7 Mechanical engineering competency requirements

Table 8 - Mechanical engineering competency requirements

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Pumping stations – Minor	Small sewage pumping stations (max 200 L/s total capacity, PN16 pressure rating, and 125 kW pump motors).	M2 or C2 (Note 4)	M3 or C3 (Note 4)	Not required
Pumping stations – Medium	Medium size sewage pumping stations and small to medium water pumping stations (including boosters), recycled water and industrial water pumping stations (max 1000 L/s total capacity, PN16 pressure rating, and 500 kW pump motors).	M3 or C3	M4	Not required
Pumping stations – Major	Large sewage and water pumping stations and individual pumping equipment and pumping systems (>1000 L/s total capacity, or >PN16 pressure rating, or > 500 kW pump motors).	M3 or C3	M4	M4
Pipework – Minor	Unburied/above ground, submerged and partially buried pipework within pumping stations, treatment plants and similar facilities, ≤ DN300 and ≤ PN16 pressure rating, including small bore process, sampling, testing etc. pipework.	M2 or C2 (Note 4)	M3 or C3 (Note 4)	Not required
Pipework – Medium	Unburied/above ground, submerged and partially buried pipework within pumping stations, treatment plants and similar facilities, ≤ DN750 and ≤ PN16 pressure rating.	M3 or C3 (Note 4)	M4 or C4 (Note 4)	Not required
Pipework – Major	Unburied/above ground, submerged and partially buried pipework within pumping stations, treatment plants and similar facilities, > DN750 and/or > PN16 pressure rating or ductile iron pipework > PN16 pressure rating.	M3 or C3	M4	M4
Ventilation	Natural ventilation systems.	M1	M2	Not required
Ventilation	Forced ventilation systems.	M2	M3	Not required
Odour control	Odour control units (network and treatment).	M2	M3	Not required
Treatment – Mechanical equipment	Sewage screening and handling, sludge thickening, dewatering and handling, compressed air service, aeration, digester mixing,	M3	M4	M4 (Note 1)

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
	waste gas burners and other water and wastewater treatment equipment.			
General mechanical	Uncommon mechanical equipment not specifically related to particular assets (eg surge/pressure vessels, lifting equipment, diesel/gas engines etc).	M2	M3	M3 (Note 2)
Flow control – Minor	Flow control and isolation facilities ≤ DN750, including valves, penstocks, bulkheads and stop boards; associated electric, hydraulic and pneumatic actuators.	M2 or C2 (Note 4)	M3 or C3 (Note 4)	Not required
Flow control – Major	Large or critical/complex flow control and isolation facilities > DN750, including valves, penstocks, bulkheads and stop boards; associated electric, hydraulic and pneumatic actuators; pressure reducing and pressure sustaining valves, flow/pressure automatic control valves etc.	M3 or C3	M4	Not required
Low pressure sewerage systems	Low pressure sewerage systems, including property pump-outs, boundary kits, private lines and common pressure mains.	M1 or C1 (Note 4)	M2 or C2 (Note 4)	Not required
Vacuum sewerage systems	Vacuum sewerage systems, including reticulation (vacuum pots, vacuum valves and vacuum lines), vacuum pumping stations	M2 or C2 (Note 4)	M3 or C3 (Note 4)	Not required
Chemical dosing and handling	Chemical dosing plants/systems and chemical handling equipment	M3 or P3 (Note 4)	M4 or P4 (Note 4)	M4 (Note 3)

Note 1: Required for solids dewatering, handling and digester mixing equipment (does not include proprietary digester mixing systems).
Note 2: Required for equipment where specialist expertise and/or potential hazards involved, eg. pressure vessels, lifting equipment, gas installations, chemical handling etc.
Note 3: IV not required for chemical dosing designs supplied as per DTCs.
Note 4: Either the designer or the verifier must be a mechanical engineer.

Table 9 - Minimum qualifications and experience for mechanical engineering

Classification	Minimum academic qualification	Minimum professional qualification	Minimum years of relevant experience	Minimum number of comparable jobs
M1	Bachelor's degree in mechanical engineering	Not required	2	2
M2	Bachelor's degree in mechanical engineering	Not required	5	3
M3	Bachelor's degree in mechanical engineering	CPEng & NER (Mechanical)	7	4
M4	Bachelor's degree in mechanical engineering	CPEng & NER (Mechanical)	10	5

3.8 Electrical engineering competency requirements

Table 10 - Electrical engineering competency requirements

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Minor LV power reticulation design	Design of a LV system with one or two sources of supply (grid connection) with no auto-changeover and no other alternate sources of supply	E1	E2	Not required
Medium LV power reticulation design	Design of a grid connected LV reticulation system with multiple power sources (eg no auto changeover facilities, radial distribution only, manual changeover on standby power sources, overhead LV equipment)	E2	E3	E3 (Note 4)
Major HV power reticulation	Design of a HV system with one or more grid connections, with interlocking systems and/or manual changeover facilities to alternate power sources (permanent or standby generator)	E3	E4	Not required
Complex power reticulation design	Design of a system (LV or HV) or a site with multiple power sources (eg more than one incomer from supply authority, temporary or permanent standby generators, energy storage system [excluding UPS], renewable energy sources, auto changeover facility, overhead HV equipment)	E3	E4	E4
Power system analysis	Modelling of the electrical reticulation network (includes but not limited to load flow, transient analysis, alternate sources, modelling changes in open point)	E1	E3	Not required
Minor Protection system design	Protection design and implementation of a LV system with one or two sources of supply	E1	E3	Not required
Medium Protection system design	Other systems not covered above (eg grading between HV and LV reticulation, multiple operating scenarios (alternate sources, change in open point))	E2	E3	E3 (Note 4)
Arc flash analysis and mitigation	System modelling, hazard analysis, mitigation design and implementation	E2	E4	E4 (Note 4)
Auto change over design	Design of automatic changeover system design involving any of the following: • multiple sources of grid supply	E3	E4	E4

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
	• anti-islanding operation • changeover to standby sources			
Medium Lightning protection system	Design of lightning protection system	E2	E3	Not required
Major Lightning protection system	Lightning protection systems including lightning protection for hazardous areas	E3	E4	E4 (Note 4)
Medium earthing systems	Design of an earthing system for an installation	E2	E3	Not required
Complex earthing systems	Design of an earthing system involving any of the following: HV installations, supplies unable to be synchronised, generators, inverters, varying soil conditions and high risk locations (eg areas where public can be exposed to the risk due to location, an easily accessible area)	E3	E4	E4 (Note 4)
UPS/battery backup system	Design of a UPS/battery backup system for control devices and control system.	E1 (Note 3)	E3 (Note 3)	Not required
Power factor/harmonic filter	Power factor/harmonic filter design	E2	E3	Not required
Hazardous area electrical installation	Hazardous area electrical installation design, assessment and classification	E2 (Note 1)	E3 (Note 1)	E3 (Note 1)
Electrolysis	Induced current and voltage from adjacent assets. Active cathodic protection systems.	E3	E4	Not required
Electrical distribution system control and monitoring	Design and implementation of electrical distribution control, communication and monitoring system using IEC61850	E2	E3	E3 (Note 4)
Lighting	Design of lighting system	E1	E3	Not required
Control system	Electrical design for control systems including PLC panels design, DC and UPS sizing	E1 (Note 3)	E3 (Note 3)	Not required

Note 1: Requires statement of attainment from RTO for hazardous area design and classification.
Note 2: Appropriate Accredited Service Provider (ASP) certification required for Supply Authority work.
Note 3: Design to be reviewed by Sydney Water's Operational Technology (OT) division.
Note 4: If required based on project specific risk assessment, to be determined by Sydney Water responsible SME (Table 1) or project manager.

Table 11 - Minimum qualifications and experience for electrical engineering

Classification	Minimum academic qualification	Minimum professional qualification	Minimum years of relevant experience	Minimum number of comparable jobs
E1	Bachelor's degree in electrical engineering or	Not required	5	2
	Certificate IV in a relevant electrical field	Electrical contractor licence	10	10
E2	Bachelor's degree in electrical engineering	Not required	7	3
E3	Bachelor's degree in electrical engineering	CPEng & NER (Electrical)	10	4
E4	Bachelor's degree in electrical engineering	CPEng & NER (Electrical)	15	5

3.9 Hydraulics engineering competency requirements

Table 12 - Hydraulic engineering competency requirements

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Closed conduit hydraulics	Elementary steady state hydraulics of pressure pipes and conduits, including head-loss calculations and pumped and gravity flow analysis.	H1	H3	Not required
Networks hydraulics	Complex closed conduit network/distribution system hydraulics including steady state modelling. Pumped systems with multiple pumping stations sharing suction and/or delivery/pressure mains.	H2	H3	H3 (Note 1)
Open channel hydraulics – Minor	Elementary free surface uniform flow analysis, including interim operating plan (IOP) facilities. Small waste water networks sizes ≤ DN375.	H1	H2	Not required
Open channel hydraulics – Medium	Sewer pipes ≥ DN375 and < DN750. Elementary 1D unsteady flow analysis and modelling of open channels. Sediment transfer/slime control.	H2	H3	Not required
Open channel hydraulics – Complex	Sewer pipes > DN750, stormwater pipes/open channels, time series analysis. Gradually and spatially varied flow (eg culverts). Rapidly varied flow (eg hydraulic jumps). Inverted siphons. Detailed sediment transfer/slime control. Specials – Spillways/gates/energy dissipation structures, jets/nozzles, flow control devices, spillways.	H3	H4	H4 (Note 1)
Water hammer analysis – Minor	Transient modelling (water hammer) and analysis including mitigation of minor pumping station pressure mains with no offtakes or cross-connections, ≤ DN300.	H2	H3	H3 (Note 1)
Water hammer analysis – Medium	Transient modelling (water hammer) and analysis including mitigation of medium pumping station pressure mains and major water mains, pressure mains > DN300 to ≤ DN750, and/or < 10 km long, and pipe networks.	H3	H4	H4 (Note 1)

Water hammer analysis – Complex	Transient modelling (water hammer) and analysis including mitigation of complex pumping station pressure mains and major water mains, pressure mains > DN750 and/or > 10 km long, and pipe networks.	H3	H4	H4 (Note 1)
Computational fluid dynamics modelling	Free surface and close conduit fluid dynamics modelling and analysis.	H3	H4	H4 (Note 1)
Treatment plant hydraulics	Design of hydraulic elements of flow control, flow distribution and flow measurements using design of water and wastewater treatment plant unit process requirements.	H3	H4	H4 (Note 1)

Note 1: If required based on project specific risk assessment. To be determined by Sydney Water responsible SME (Table 1) or project manager.

Table 13 - Minimum qualifications and experience for hydraulic engineering

Classification	Minimum academic qualification	Minimum professional qualification	Minimum years of relevant experience	Minimum number of comparable jobs
H1	Bachelor's degree in civil or mechanical engineering	Not required	2	2
H2	Bachelor's degree in civil or mechanical engineering	Not required	5	3
H3	Bachelor's degree in civil or mechanical engineering	CPEng & NER (Civil or Mechanical)	7	4
H4	Bachelor's degree in civil or mechanical engineering	CPEng & NER (Civil or Mechanical)	10	5

3.10 Instrumentation and control competency requirements

Table 14 - Instrumentation and control competency requirements

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Telemetry communications infrastructure	Design of telemetry network architecture	IC2 (Note 1)	IC3	Not required
Control and data networks	Design of local control and data networks, including network security	IC1 (Note 1)	IC3	Not required
SCADA architecture	Design of SCADA architecture and interfaces	IC2 (Note 1)	IC3	Not required
Control logic	Design of logic for PLCs, RTUs and other control devices (including smart equipment such as VSD, smart starter)	IC1 (Note 1)	IC3	Not required
Monitoring and control	Design of monitoring and control requirements for process control including preparation of functional design specifications	IC2 (Note 1)	IC3	Not required

Note 1: Design must be based on Sydney Water Instrumentation and Control or Treatment Plant SCADA standards. Design to be reviewed by Sydney Water's Operational Technology (OT) division.

Table 15 - Minimum qualifications and experience for instrumentation and control

Classification	Minimum academic qualification	Minimum professional qualification	Minimum years of relevant experience	Minimum number of comparable jobs
IC1	Bachelor's degree in electrical engineering or equivalent (System Engineering, Telecommunications, Mechatronics, Electronic, Computer Systems)	Not required	2	2
IC2	Bachelor's degree in electrical engineering or equivalent (Systems Engineering, Telecommunications, Mechatronics, Electronic, Computer Systems)	Not required	5	3
IC3	Bachelor's degree in electrical engineering or equivalent (Systems Engineering, Telecommunications, Mechatronics, Electronic, Computer Systems)	CPEng & NER (Electrical)	7	4
IC4	Bachelor's degree in electrical engineering or equivalent (Systems Engineering, Telecommunications, Mechatronics, Electronic, Computer Systems)	CPEng & NER (Electrical)	10	5

3.11 Building services engineering competency requirements

Table 16 - Building services engineering competency requirements

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Fire systems	Design of fire suppression and protection systems, fire indication panels, detection components etc. for Sydney Water facilities buildings.	B1	B3	B3 (Note 1)
HVAC	Design of ventilation and air conditioning systems for Sydney Water facilities buildings including switch rooms.	B1	B3	B3 (Note 1)

Note 1: If required based on project specific risk assessment, to be determined by Sydney Water responsible SME (Table 1) or project manager.

Table 17 - Minimum qualifications and experience for building services engineering

Classification	Minimum academic qualification	Minimum professional qualification	Minimum years of relevant experience	Minimum number of comparable jobs
B1	Bachelor's degree in building services, electrical or mechanical engineering	Not required	2	2
B2	Bachelor's degree in building services, electrical or mechanical engineering	Not required	5	3
B3	Bachelor's degree in building services, electrical or mechanical engineering	CPEng & NER (Building Services) or NER (Fire Safety) as appropriate	7	4
B4	Bachelor's degree in building services, electrical or mechanical engineering	CPEng & NER (Building Services) or NER (Fire Safety) as appropriate	10	5

3.12 Treatment process engineering competency requirements

Table 18 - Treatment process engineering competency requirements

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Wastewater treatment processes – assessment or renewal	Assessment of wastewater treatment asset unit processes Minor design and staging plans for like-for-like renewals	P1	P3	Not required
Wastewater treatment – greenfield sites	Design of greenfield type processes. May be on an existing site but with limited or no interaction with existing process units.	P3	P4	P4 (Note 2)
Wastewater treatment – complex brownfield	Design of wastewater treatment with complex interactions between existing and new treatment processes	P3	P4	P4 (Note 2)
Wastewater secondary treatment – design of new or augmentation of existing	Conventional activated sludge, BNR, granular, integrated fixed film, and ballasted activated sludge systems	P3	P4	Not required
Wastewater tertiary treatment – design of new or augmentation of existing	Coagulation, flocculation, clarification, filtration and disinfection, tertiary denitrification	P2	P4	Not required
Wastewater biosolids treatment and disposal – design of new or augmentation of existing	Aerobic and anaerobic digestion, autothermal thermophilic aerobic digestion (ATAD), sonication, thermal hydrolysis, thickening and dewatering, wet air oxidation, drying and pelletisation	P3	P4	Not required
Emerging technologies	Anammox, Nereda, sonification, ballasted sludge processes, etc	P3 (Note 1)	P4 (Note 1)	P4 (Note 2)
Water treatment processes – assessment or renewal	Assessment of water treatment asset unit processes. Simple design and staging plans for like-for-like renewals.	P1	P3	Not required
Water pre-treatment	Oxidation, pH correction, flotation	P2	P4	P4 (Note 2)

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Water conventional treatment	Coagulation, flocculation, clarification, filtration and disinfection	P3	P4	P4 (Note 2)
Water advanced treatment	Membrane, UV, ozonation, activated carbon, advanced oxidation	P3	P4	P4 (Note 2)
Water residuals treatment	Sludge thickening, sludge drying and dewatering, supernatant treatment	P3	P4	P4 (Note 2)
Recycled water	Treatment and control system for recycled water systems	P3	P4	Not required

Note 1: No. of comparable jobs may not apply due to potentially limited number of applications; relevant master's level academic qualifications may substitute for number of jobs.
Note 2: If required based on project specific risk assessment, to be determined by Sydney Water responsible SME (Table 1) or project manager. The complexity of project (renewal, greenfield, brownfield) and type of process must both be considered.

Table 19 - Minimum qualifications and experience treatment process engineering

Classification	Minimum academic qualification	Minimum professional qualification	Minimum years of experience	Minimum number of comparable jobs
P1	Bachelor's degree in civil, environmental or chemical engineering or master's degree in water & wastewater engineering	Not required	2	2
P2	Bachelor's degree in civil, environmental or chemical engineering or master's degree in water and wastewater engineering	Not required	3 (5) (Note 1)	3
P3	Bachelor's degree in civil, environmental or chemical engineering or master's degree in water and wastewater engineering	Not required	5 (7) (Note 1)	4
P4	Bachelor's degree in civil, environmental or chemical engineering or master's degree in water and wastewater engineering	CPEng (Note 2)	10 (15) (Note 1)	5

Note 1: Number of years of experience in brackets correspond to any other engineering degree other than that are nominated under minimum academic qualifications.
Note 2: CPEng or minimum experience in the brackets, with no CPEng.

3.13 Stormwater and WSUD competency requirements

Table 20 - Stormwater and WSUD competency requirements

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Stormwater – System planning	Flood studies that align with the Flood Risk Management Manual NSW, 2023. 2D flood modelling ie TUFLOW or other approved method. Risk assessments and risk management plans Project costing at concept and detailed design stages. Technical Specifications (based on Sydney Water standard Technical Specifications). Review of Environmental Factors (REF) at concept and detailed design stages (per Sydney Water's REF template).	SW2	SW3	SW4 (Note 1)
Stormwater – Hydraulics	Open channel, closed conduit, CFD, TUFLOW or other approved method calculations. Recycled water supply and demand modelling. Low flow and drought risk analysis Catchment, waterway, stormwater drainage and drainage network hydraulic modelling Overland flow studies including preparation of models and reports.	Refer to hydraulics engineering competency requirements.		
Stormwater – Pipes and structures	Stormwater pipes, access chambers, culverts, open channels, headwalls, drop structures, energy dissipaters.	Refer to civil, structural and geotechnical engineering competency requirements depending on the type of asset, site conditions and complexity of work to be undertaken.		
Stormwater – SQIDS	Stormwater quality improvement devices (SQIDS) including gross pollutant traps, trash racks, booms etc	SW2	SW3	N/A
Stormwater – Asset protection and maintenance access	Specialist engineering assessment required for building over or adjacent to stormwater assets. Selection and design of liners, ground amelioration, surface treatment (armouring, sandstone rip rap, toe rock details etc.). Design of maintenance tracks and access points.	Refer to civil, structural and geotechnical engineering competency requirements depending on the type of asset, site conditions and complexity of work to be undertaken.		

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Stormwater – Rehabilitation	Structural appraisal and rehabilitation stormwater pipes, rectangular and oviform structures.	Refer to civil, structural and geotechnical engineering competency requirements depending on the type of asset, site conditions and complexity of work to be undertaken.		
Waterway naturalisation and WSUD including stormwater harvesting and reuse.	Wetlands, bioretention systems, bank naturalisation. Water quality modelling ie MUSIC (V06 and later) and hydrologic modelling. Stormwater harvesting and reuse - Stormwater collection (offtake structure), storage (ponds, tanks etc.) and distribution (pumping and pipes). Note: • For stormwater treatment and disinfection see Treatment Process engineering section. • for SCADA and controls see Instrumentation and Control section • for electrical requirements see Electrical Engineering section	SW2	SW3	N/A
Ecologist	Plant selection, ecological waterway health assessment, existing values mapping and protection in design, tree protection, vegetation management plans, waterway management plans, operation and maintenance plans for blue/green infrastructure, wildlife strike risk management (for areas near airports).	ES2	ES3	N/A
Erosion and sediment control	Erosion and sediment control planning and implementation	ES1	ES4	N/A
Landscape	Landscape design plans, plant selection, liveability and aesthetic aspects Integration with natural landscape, protection and enhancement of natural features and values, active transport, public safety, enhance user experience (connections and cooling). Urban design site analysis to identify and communicate opportunities for livability (in particular cool climate, recreational opportunities and First Nations opportunities for connection to Country).	ES2	ES3	N/A

Note 1:
If required based on project specific risk assessment, to be determined by Sydney Water responsible SME (Table 1) or project manager.

Table 21 - Minimum qualifications and experience stormwater and WSUD

Classification	Minimum academic qualification	Minimum professional qualification	Minimum years of relevant experience	Minimum number of comparable jobs
SW1	Bachelor's degree in civil engineering or	Not required	2	2
	other appropriate Bachelor's degree in engineering or related science	Not required	5	2
SW2	Bachelor's degree in civil engineering or	Not required	5	5
	other appropriate Bachelor's degree in engineering or related science	Not required	7	5
SW3	Bachelor's degree in civil engineering or	Not required	7	8
	other appropriate Bachelor's degree in engineering or related science	Not required	10	8
SW4	Bachelor's degree in civil engineering or	CPEng and NER (Civil) or appropriate professional membership	10	10
	other appropriate Bachelor's degree in engineering or related science	CPEng and NER (Civil) or appropriate professional membership	15	10
ES1	Bachelor's degree in environmental science / conservation / land management / urban design or related discipline	Not required	2	2
ES2	Bachelor's degree in environmental science / conservation / land management / urban design or related discipline	Not required	5	5
ES3	Bachelor's degree in environmental science / conservation / land management / urban design or related discipline	Not required	7	8
ES4	Bachelor's degree in environmental science / conservation / land management / urban design or related discipline	Not required (Note 1)	10	10

Note 1: Verifiers and independent verifiers for erosion and sediment control plans require Certified Professional in Erosion and Sediment Control from International Erosion Control Association or an equivalent qualification.

3.14 Dam Safety

Table 22 - Dam safety competency requirements

Category of design work	Sub-categories and description of design element or works	Minimum designer classification	Minimum verifier classification	Minimum independent verifier classification
Liquid holding tanks classified as declared dams	Dam safety assessment of liquid holding tanks classified as declared dams as required by *NSW Dam Safety Act or Regulation*	As required by *NSW Dam Safety Act or Regulation* *(Level 4 competency regardless of discipline, including mandatory IV for all design elements)*		

4. Competence assessment process

The general steps for the assessment of competence are:

- Step 1: Applicant gathers evidence of competence for the role or task to be performed
- Step 2: Self-assessment against competency requirements by applicant
- Step 3: Written submission by the design manager to the project manager (or case manager) with evidence for review and acceptance
- Step 4: Review by project manager (or case manager)
- Step 5: Review by Sydney Water SME if necessary
- Step 6: Acceptance of competency levels by project manager (or case manager).

5. Evidence of competence

This standard requires evidence of qualifications, skills and experience to substantiate the assessment of competence by the applicant.

Evidence submitted to the project manager or case manager may include the following:

- qualifications, training courses undertaken, skills, experience
- information on previous designs undertaken including their complexity and feedback received on completed designs from clients, including referees
- current role, length of time in role and evaluated performance level in carrying out tasks of the role
- career logbook.

A form that may be used by an applicant is shown in Appendix A. A curriculum vitae with generic experience without relevant details to specific tasks is not adequate.

6. Validity period of competence allocation

The validity of assessment is until the end of the design engagement or for a period defined by the responsible SME (Table 1) or the expiration of three years from the date of assessment, whichever comes first.

For continuing involvement in design tasks or to perform at a higher level of competence, a person must have their competency levels reassessed.

A competence allocation may be withdrawn or reduced if performance falls short of the expected levels of performance.

Ownership

Ownership

Role	Title
Group	Asset Lifecycle
Owner	Engineering Manager
Author	Gary de Leeuw, Technical Director - Civil

Change history

Version No.	Prepared by	Date	Approved by	Issue date
1	Tony Petrevski, Milan Rubcic, Robert Lau, Christie Sebaratnam, Robert Loncar	11/06/2018	Ken Wiggins, Manager, Urban Design & Engineering	11/06/2018
2	Tony Petrevski, Milan Rubcic, Robert Lau, Christie Sebaratnam, Robert Loncar	28/08/2018	Ken Wiggins, Manager, Urban Design & Engineering	28/08/2018
3	Milan Rubcic, Christie Sebaratnam, Robert Loncar, Dinesh Dineshharan, Susan Kitching	08/10/2019	Ken Wiggins, Manager, Urban Design & Engineering	08/10/2019
5	Dinesh Dineshharan (Lead Engineer-Geotech), Milan Rubcic (Lead Engineer- Mechanical), Robert Lau (Lead Engineer- Electrical), Christie Sebaratnam (Lead Engineer- Structural), Robert Loncar (Lead Engineer-Civil), Ashley Smith (Lead Engineer- Process)	15/02/2021	Norbert Schaeper, Engineering Manager	17/10/2024
5	Gary de Leeuw (Technical Director -Civil Engineering), Ali Khan (Technical Director-Geotechnical Engineering), Milan Rubcic (Technical Director- Mechanical Engineering), Paul Zhou (Technical Director- Electrical Engineering), Christie Sebaratnam (Technical Director- Structural Engineering), Robert Loncar (Technical Director-Standards), Kirtan Kelaiya (Technical Director- Process Engineering)	24/09/2024	Norbert Schaeper, Engineering Manager	17/10/2024

Appendices

Appendix	Title
A	Evidence of competency form – Example

Appendix	Title
B	Independent verification certificate

Appendix A. Evidence of competency form – Example

Individual designer qualifications and relevant experience

Name:	*Joe Bloggs*
Position title:	*[eg Senior Civil Engineer]*
Organisation:	*[eg XYZ Consulting Pty Ltd]*
Role at organisation:	*[eg Pipelines design lead for civil pipelines for the water industry]*
Role on project:	*[eg Civil pipeline lead designer]*
Qualifications:	*[eg BEng (Civil), CPEng MIEAust NER (Civil)]*

Engineering discipline	Proposed Category and Sub-Category of Design Work (as per Table 3)	Required Competency Level
[eg Civil engineering]	*[eg Pipelines – Major – Buried water/sewer/stormwater pipes DN750 – DN1200 at depth ≤ 15 m]*	*[eg C3]*

Comparable jobs

Project name	Project description	Client	Details of design tasks carried out	Referee and contact details
[eg Prospect to Macarthur pipeline]	*[eg Concept design of DN750 water main]*	*[eg Sydney Water]*	*[eg Civil pipeline designer carrying out design calculations, preparation of drawings and reporting. Outline the design activities and tasks directly relevant to the claimed category of design work undertaken in the course of design development such as FEM, structural design, hydraulic analysis etc]* *[In order for a designer to advance to a higher level of competence, include here details of current level of competence, exact details of nature of experience gained, and under whose direction and direct supervision this experience has been gained. Include what level of competence this is evidence of.]*	*[eg William Broms, Sydney Water]*
List additional jobs as necessary to demonstrate compliance with required competency classification level				

Competence statement *Outline years of relevant experience and describe relevance of listed experience to the competencies requested)* *Attach detailed CV, with relevant details*	*[eg I have over 10 years of experience in various senior engineering roles across 20 projects directly related to design of major pressure and non-pressure DN750–DN1200 pipelines, and associated structures. I possess the necessary design skills through knowledge of and application of relevant industry pipe design and installation standards and engineering practices to successfully achieve required design outcomes. Design knowledge and skills include structural analysis and design of buried flexible and rigid pipes, interpretation of ground conditions, hydraulic analysis product/material selection, corrosion protection, hydraulics (closed conduit/open channel), trench design, thrust/anchor block design, system planning and configuration design for safe and effective operation, connections, route selection/vertical alignment, knowledge of conventional and trenchless construction methods, and application Safety in Design principles and inspection, testing and commissioning requirements.]*

I certify that I possess the required qualifications, knowledge, skills and experience to successfully undertake the required design and verification activities for the proposed category and sub-category of design work nominated above.

Signed:		Date:	

Appendix B. Independent verification certificate

Project details

Item	Details
Project name	
Organisation accountable for design/asset impact assessment	
Purpose of independent verification (design/asset impact assessment)	
Verified design component/asset	
Independent verifier organisation	
Associated engineering disciplines	

Schedule of Certified Design Documentation *(List all verified documents)*

Name	Document Type	Revision/ Version
[Enter text]	*Example: Drawing/ Specification/ Report/ Calculations/ Impact assessment/ System Model/ Need Specification*	*[Enter text]*

Compliance Statement *(strikeout components when not relevant)*

I/ We certify that I/We have:

1. Undertaken an independent engineering verification in relation to the design/ impact assessment represented by the drawings / specifications/ report/ calculations provided by the designer as listed in the above schedule;
2. Carried out a detailed check of individual design elements and the proposed asset as a whole including specified material properties;
3. Reviewed all the relevant inputs in accordance with Sydney Water Technical Specifications Civil, Mechanical, Electrical;
4. Reviewed the proposed construction procedure and the aspects of associated impacts on the Sydney Water and other assets;
5. Fulfilled the role and responsibility of the independent verifier in accordance with Sydney Water's Engineering Competency Standard (BMIS number: D0000833).

In performing the function of Independent Verification, I/ We have used due skill, care and diligence and from my/ our review and in my/ our opinion as a professional engineer, I/ We consider that:

A. All relevant design actions and design criteria are covered by the design and that these actions and criteria and overall concept meet the requirements of the intent of the design/ impact assessment

B. The strength, stability, serviceability, durability and other Limit State requirements as defined in the Sydney Water technical specifications are met; and

C. The construction drawings and specifications accurately describe the following matters critical to the structural integrity:

    a. Detailing and dimensions,

    b. The required material properties and

    c. The construction procedure and temporary works.

Independent verifier personnel and signatures *(List all relevant discipline independent verifiers)*

Name	Discipline	Relevant Engineering Competency Classification	Signature

References *(List relevant Standard, where compliance is checked against)*

Document Title	Version	Document Type	**Relevance**
[eg.: Technical Specification- Civil]	*[eg.: V9.0]*	*Technical Specification*	
[eg: Technical Specification Mechanical]	*[eg.: V11.0]*	*Technical Specification*	
[eg.: Technical Specification Electrical]	*[eg.: V12.0]*	*Technical Specification*	
BOA Guideline	*[eg.: V1.0]*	*Guideline*	