Australian Standard - AS2159
Piling - Design and Installation

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Draft Standard - DR05506

- Updates
- Changes and Additions
- Current Status

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STRUCTURE OF THE STANDARD

- Scope and General
- Site Investigations
- Design Requirements and Procedures
- Geotechnical Design
- Structural Design
- Design for Durability
- Materials and Construction Requirements
- Testing
- Appendices

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SCOPE AND GENERAL

- Applicable Structures
- Definitions
- Terminology
- Pile Classifications - Displacement , Replacement

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SITE INVESTIGATIONS

- Acknowledged that investigations are generally below par
- Increased investigation to be encouraged

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DESIGN REQUIREMENTS AND PROCEDURES

- Ultimate
- Serviceability - negative friction
- Durability

GEOTECHNICAL DESIGN

- Assessment of geotechnical parameters – new section, for guidance
- Assessment of geotechnical reduction factor, Øg
- Combined pile & raft foundation
- Negative friction - Serviceability

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ASSESSMENT OF GEOTECHNICAL REDUCTION FACTOR

- Underlying philosophy:
  - Reduce ad-hoc judgement in selection
  - Consider risks involved more specifically
  - Provide incentive for pile testing
  - Allow for benefits of redundant foundation systems

ASSESSMENT OF GEOTECHNICAL REDUCTION FACTOR

$$\varnothing_g = \varnothing_{gb} + (\varnothing_{tf} - \varnothing_{gb}) \cdot K \quad >= \varnothing_{gb}$$

where $\varnothing_{gb}$ = basic factor

$\varnothing_{tf}$ = intrinsic test factor

K = testing benefit factor

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BASIC GEOTECHNICAL REDUCTION FACTOR, $Ø_{gb}$

- Depends on assessed risk factors & weighting of risks
- Factors considered:
  - Site factors
  - Design factors
  - Installation factors
- Weighting factor and Individual Risk Rating

BASIC GEOTECHNICAL REDUCTION FACTOR, $Ø_{gb}$

Average Risk Rating ARR

$$ARR = \Sigma (w_i . IRR_i) / \Sigma wi$$

where w_i = weighting factor for factor considered

IRR_i = Individual risk rating

BASIC GEOTECHNICAL REDUCTION FACTOR, $Ø_{gb}$

$Ø_{gb}$ related to ARR and to redundancy of system

ARR	Risk Level	ϕ_{gb} (low redundancy)	ϕ_{gb} (high redundancy)
<1.5	Very low	0.67	0.76
3-3.5	Moderate	0.48	0.56
>4.5	Very high	0.40	0.47

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INTRINSIC TEST FACTOR, $Ø_{tf}$

- 0.9 - static load testing
- 0.8 – dynamic load testing & rapid load testing

TESTING BENEFIT FACTOR, K

- For static or rapid testing:
  - K = 1.133p / (p + 1.333)
- For dynamic load testing:
  - K = 1.133p / (p + 6.667)

p = % total piles tested

K <= 1.0

NEGATIVE FRICTION

- In absence of other information, assume geotechnical strength unaffected by negative friction
- Serviceability must be considered:
  - Via pile-soil interaction analysis
  - OR via requirement for pile embedment in “stable zone” to satisfy strength criterion against applied load & downdrag force

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STRUCTURAL DESIGN

- Terminology changed to comply with AS1170 - some simplifications are still to be completed
- Clarification of 'diameter' for non-uniform piles
- Pile splices - non-structural comments added
- Reduction factor for structural design - similar to current Tables 4.1 and 4.2
- Minimum reinforcement for driven concrete piles
- Steel screw piles added

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MATERIAL & CONSTRUCTION REQUIREMENTS

- New section on installation by jacking
  - Requirements for installation force
  - Repeated jacking required (min. 5 repeats)
  - Installation process NOT equivalent to static load tests
- Screwed steel piles
- Screwed cast-in-place

TESTING

- Testing encouraged
- Testing benefit factors reward testing
- Expanded section on integrity testing
- Test loads to account for negative friction

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TESTING

- Acceptance criteria based on load level and pile size for both Static and Dynamic load tests

Load	Maximum deflection mm
Ps	PsL/AE + 0.01d
0 (after removing Ps)	0.01d
Pu	PuL/AE + 10 + 0.05d
0 (after removing Pu)	10 + 0.05d

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OVERALL OBJECTIVES

- Improve standard of design & construction
- Require consideration of risk factors
- Encourage pile testing - Benefits arise from testing; Required for some circumstances
- Encourage monitoring of performance, both during and after installation

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