Assignment Guide

OLD-020 Conductor Solutions

Purpose of this document

This guide set out the requirements for completing your assignment. It includes a description of the project scenario and site details, the design variables, the tasks to be completed, and format requirements. It also suggests a process you might like to use for working with others on the review tasks and describes how you will be assessed.

The project scenario

An existing Mullet conductor at Nelson Creek, near Greymouth has been identified as being in poor condition and requires replacement.

As-built information is available for line refurbishment work previously completed in 2010. This includes a plan, a pole schedule, standard construction drawings and photos of the poles which can be used to gain an appreciation of the site conditions.

Design constraints

The replacement conductor does not need to be any larger than the Mullet for electrical purposes, however it must be selected from the standardised set of conductors used on this network as shown in green and blue in the table below.

Conductor Name	Construction	Diameter (mm)	Calculated breaking load (kN)	Maximum DC resistance @ 20°C (Ω /km)
Mullet	ACSR/GZ/SB	4.90	7.7	2.156
Chlorine	AAAC	7.50	8.2	0.864
Fluorine	AAAC	9.00	11.8	0.601
Helium	AAAC	11.30	17.6	0.383
Iodine	AAAC	14.30	27.1	0.239
Neon	AAAC	18.80	47.8	0.142
Nitrogen	AAAC	21.00	62.2	0.114
Oxygen	AAAC	23.80	73.6	0.088
Squirrel	ACSR/GZ	6.33	7.9	1.370
Gopher	ACSR/GZ	7.08	9.6	1.093
Ferret	ACSR/GZ	9.00	15.3	0.677
Mink	ACSR/GZ	11.00	21.7	0.454
Dog	ACSR/GZ	14.20	32.7	0.273
Wolf	ACSR/GZ	18.10	68.9	0.183

It has been decided that, as part of the reconductor project, pole 33193 will be converted into a strain pole. After this change, the pole types and attachment heights will be as listed in the following table.

Peg number	Current pole number	Attachment height (m)	Pole function	Pole construction type
0	34538	8.77	Strain	495
1	38460	8.95	Intermediate	110
2	38461	8.95	Intermediate	477
3	38462	8.72	Strain	56
4	38463	8.95	Intermediate	227
5	38464	8.8	Strain	114
6	38465	8.95	Intermediate	109
7	38466	8.95	Intermediate	110
8	38468	9.65	Intermediate	555
9	38469	10.22	Intermediate	311
10	38470	9.65	Intermediate	556
11	33193	8.8	Strain	114

Assume that the spans are flat, except in span 8-9 which has a 4.3m depression at midspan, and in span 10-11 which has a 7.6m depression at midspan.

Spans 0-3 can be considered alongside the road, so require a clearance of 6.5m under NZECP 34:2001, whereas the other spans are traversable but not along the road, so require a clearance of 5.5m.

Design variables

You will be assigned one of the following sets of variables to use as inputs for your design work. Refer to the Role Assignments document to find out which Design Set you will use.

Design Set	Design wind pressure (Pa)	Design snow radius (mm)	Maximum operating temperature (°C)
1	1400	35	50
2	1800	30	60
3	1200	25	75

Design objectives

Safety objectives for the solution are provided as follows. These are drawn from the obligations of designers under Section 39 of the Health and Safety at Work Act 2015.

To ensure, as far as is reasonably practicable, that:

- the solution is designed to be without risks to the health and safety of people
- adequate information is provided for the purposes of giving effect to the design

Quality objectives for the solution may be naturally linked (in whole or in part) to the safety objectives, but are defined here separately, for clarity:

To ensure, as far as is reasonably practicable, that:

- the solution is designed to minimise lifecycle cost impacts (e.g. early replacement)
- regulation and industry standards are adhered to through design documentation

Note: Legally, safety duties are placed on the PCBU rather than the individual, hence the need to consult and involve others in your decision-making processes and communications.

Your assignment tasks

You have two key tasks to perform for this assignment, and each task has a corresponding deliverable:

- Develop a Design Report – to outline the engineering basis for your design choices
- Produce Construction Information – to communicate your design intent for construction and maintenance purposes

Design report

Prepare a single report that includes:

1. Your understanding of the scope and key information, including design parameters
2. Design arguments for selecting one conductor over another
3. Evidence of calculation to confirm the selected conductor is suitable for:
   a) Vibration design
   b) Mechanical ultimate load under design wind pressure at 10°C
   c) Mechanical ultimate load under the design snow radius at 0°C with M_{rel} = 1.0
   d) Clearance at the maximum operating temperature.

Include references to design standards and tools/methods, as appropriate

Construction information

For the chosen solution, produce a single document that includes:

4. A stringing chart that field crews will need to correctly install the conductor.
5. Material schedules, including any associated hardware integral to the design
6. Construction drawings and any additional instructions that field crews will need to correctly install the conductor.

Required formats

Both the design report and construction information are required to be output to PDF before uploading to the online platform. The design work that informs these files may be produced using software of your choosing.

Method used to assess your assignment

The following criteria are drawn from the practice-based learning outcomes for the course. (Note that the quizzes make up the 20% balance.)

Component	Criteria	Worth
Project (80%)	Decision-making - Suitable componentry is selected and arguments for design choices are clear and supported	10%
	Calculation - Engineering design work is relevant, accurate and comprehensive, with assumptions explained	40%
	Communication - All necessary information is provided and design intent is clear, with correct terminology used	20%
	Professionalism - Information is clearly presented, with appropriate standards and sources referenced	10%

Assessors will score your work against each criteria using the following three-point scale:

1	BELOW EXPECTATIONS - Significant gaps demonstrated - assessor to explain why, and what is missing
3	SUFFICIENT, WITH GAPS - Some gaps demonstrated - assessor to explain why and make recommendations to improve
5	ACCEPTABLE - Criterion is well met - assessor comment not required