

Complimentary services to aid selection, design and installation

ACO has an established Technical Services Department with many years experience advising on surface drainage. This free service is offered with no obligation and is supported with extensive, high quality information, brochures and technical documentation.

Trench hydraulics

SERVICE 1



ACO's Technical Services department will provide assistance in the design of the most hydraulically efficient and cost effective drainage layouts. Using 'Hydro', a purpose written computer software program, ACO will provide solutions with all rainfall and catchment design variables considered.

ACO can supply:

- Hydraulic plots and calculations for individual trench runs

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Grate performance hydraulics

SERVICE 2



ACO's 'GIC' (Grate Intake Calculator) computer software program is based on calculations and empirical data derived from full scale experimentation. The 'GIC' plot provides information on grate performance relative to project catchment geometries.

ACO can supply:

- Project specific grate performance plot

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Run layout & scheduling

SERVICE 3



For large catchment areas where complex surface drainage layouts are required, ACO can recommend a trench drain solution to satisfy project cost and design requirements. Run layouts can be designed to take full advantage of the existing and proposed site grades and utilise existing services where possible.

ACO can supply:

- Plan layouts of trench runs (CAD)
- Section layouts of trench runs showing modular sequence of channel units
- Parts schedules fully itemising parts and pieces

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Ponding analysis

SERVICE 4



Temporary ponding can be tolerated during an intense storm in applications where the impact is low, e.g., away from buildings, parking lots, etc. An assessment is made of the behaviour of the ponding pattern when a smaller, more economical, trench is used.

ACO can supply:

- Map of temporary ponding

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Materials

SERVICE 5



There are a variety of materials available for trench drain systems. Each material behaves differently in various environments and situations. Following extensive testing, ACO can provide advice on chemical and corrosion resistance for most common trench drain materials.

ACO can supply:

- Material samples for on site testing

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1. Trench hydraulic service

'Hydro' is a purpose written, hydraulic design program modelled on differential calculus for non-uniform flow in open channels, (See page 11). The program was further refined with empirical data, following a series of experiments modelling lateral intake into trenches. Analysis of the effect of slope, run length, and trench cross sectional profiles were incorporated into the program.

Complex scenarios such as the effects of water inflow from downpipes or inlets along the length of the trench can also be modelled by the 'Hydro' program. ACO can use 'Hydro' to recommend optimum outlet positions along trench runs.

'Hydro' plot shows:

- 1

Position and size of minimum 'freeboard' (gap between the underside of the grate and the top of liquid in trench)
- 2

The hydraulic profile of the liquid
- 3

Flow velocity and flow rate at all points along the trench
- 4

Discharge flow rate capacity of the channel run. (14.75 l/s from example below)
- 5

Hydraulic utilisation of trench (%) is given. If over 100%, flooding occurs. (71.35% from example below)



To generate results from the 'Hydro' program, the following information is required:

- Length of trench run (metres)
- Length and width of catchment area (metres) - see page 12
- Surrounding pavement/surface type, e.g., concrete, asphalt, etc.
- Rainfall intensity (mm/hr)
- Ground fall along trench (%)
- Perpendicular approach slopes to trench (%)
- Preferred position of outlets along trench run and any outlet size restrictions
- Any slab depth restrictions

Results are provided either electronically and/or in printout format.

See page 91 for a grated trench drain request form

2. Grate hydraulics

ACO has independently measured, by experimentation, the hydraulic intake capacities of ACO Drain grates. Tests were carried out under varying flow rates and catchment approach slopes. To determine the hydraulic utilization, each grate was tested until bypass occurred (point at which liquids would pass across grate).

The Grate Intake Calculator (GIC) provides information on the intake efficiency of the chosen grate. If the required liquid intake is greater than the grate's performance, the extent of bypass (or failure) will be calculated.

See page 15.

'GIC' plot shows:

- 1

Catchment geometry and hydraulics
- 2

Head of water approaching grate
- 3

Additional notes relating to grate performance
- 4

Recommended grate information
- 5

Total intake area per metre of trench run
- 6

Hydraulic utilization of grate (100% means all grate intake capacity is used)

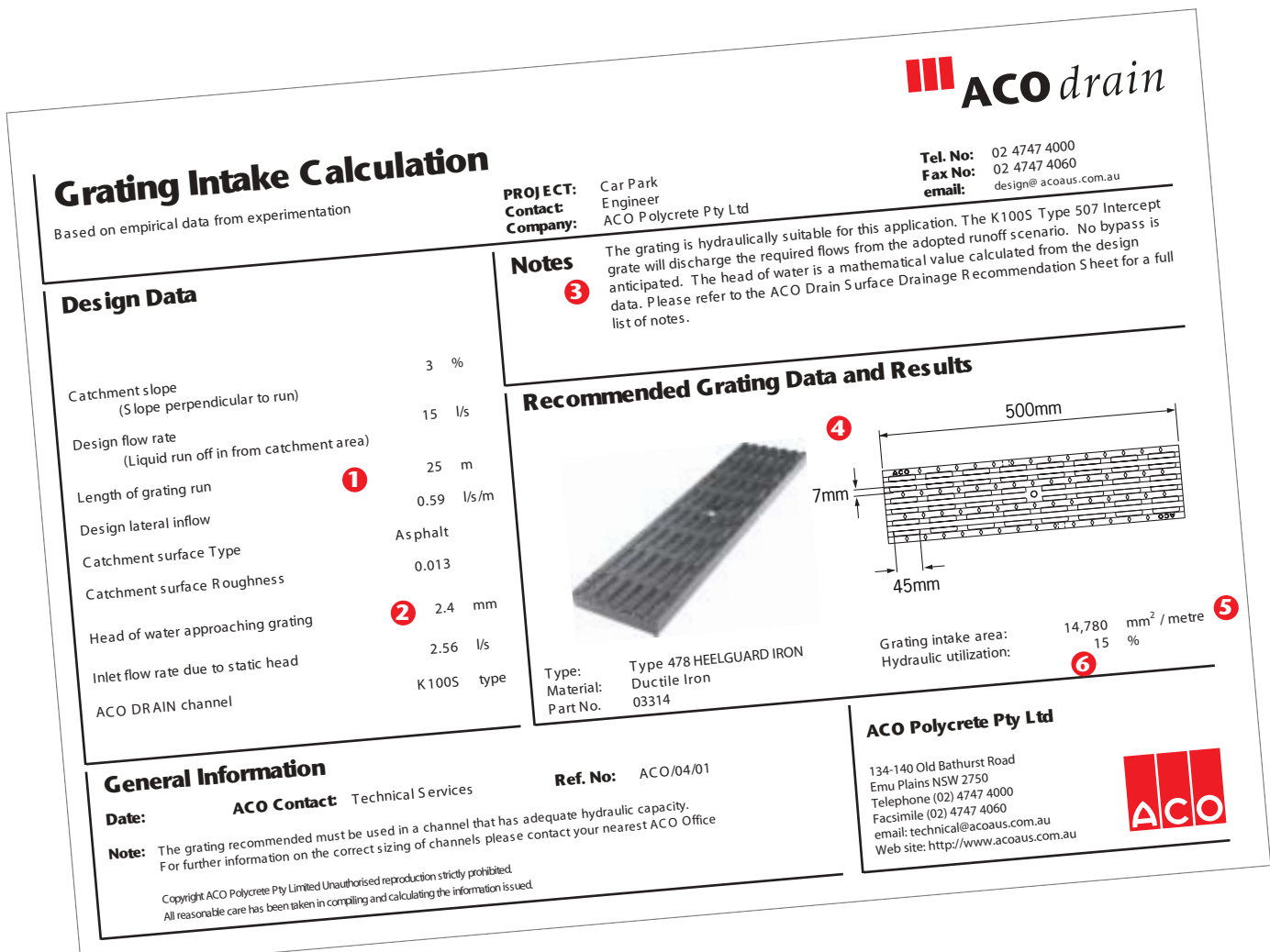
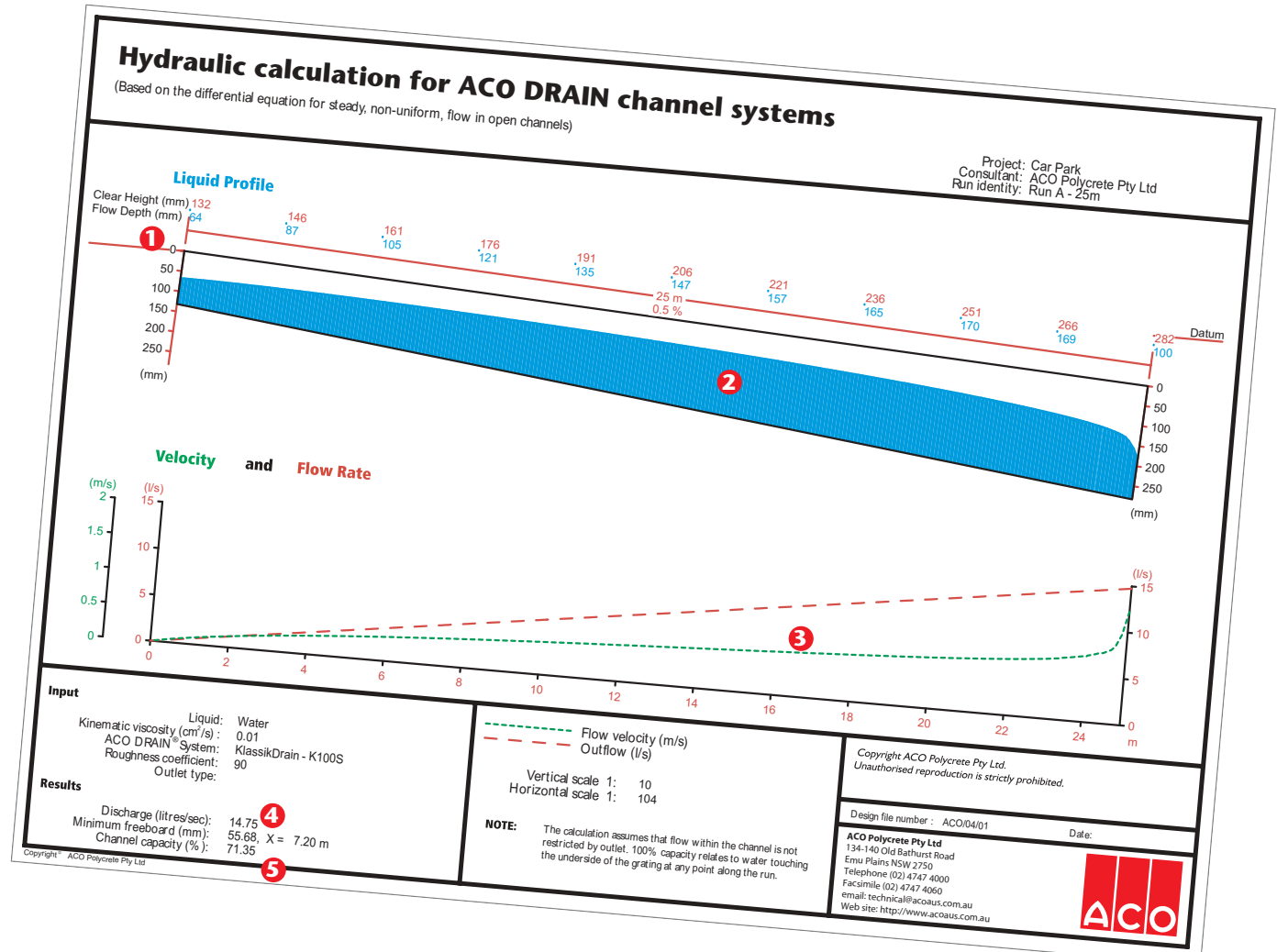


To generate results from the 'GIC' program, the following information is required:

- Length of trench run (metres)
- Length and width of catchment area (metres) - see page 12
- Position of trench in catchment area
- Surrounding pavement/surface type, e.g., concrete, asphalt, etc.
- Rainfall intensity (mm/hr)
- Perpendicular approach slopes to trench (%)
- Preferred grate type

Results are provided either electronically and/or in printout format.

See page 91 for a grated trench drain request form



4. Ponding analysis

Temporary ponding is a short lived flood situation, which, in some circumstances, can be tolerated allowing an intentionally undersized trench drain system. It allows a more economical system to be used that will work effectively under most weather conditions, but will be slightly under designed for heavy storms.

Ponding analysis should only be considered where buildings and property are not in close proximity to the drainage system to minimize risk of damage. It is an ideal option for the outer areas of large parking lots, distribution yards, etc., (Risk Analysis).

The Ponding Analysis map shows the size and duration of the flood.

In order to produce a ponding analysis, the following information is required:

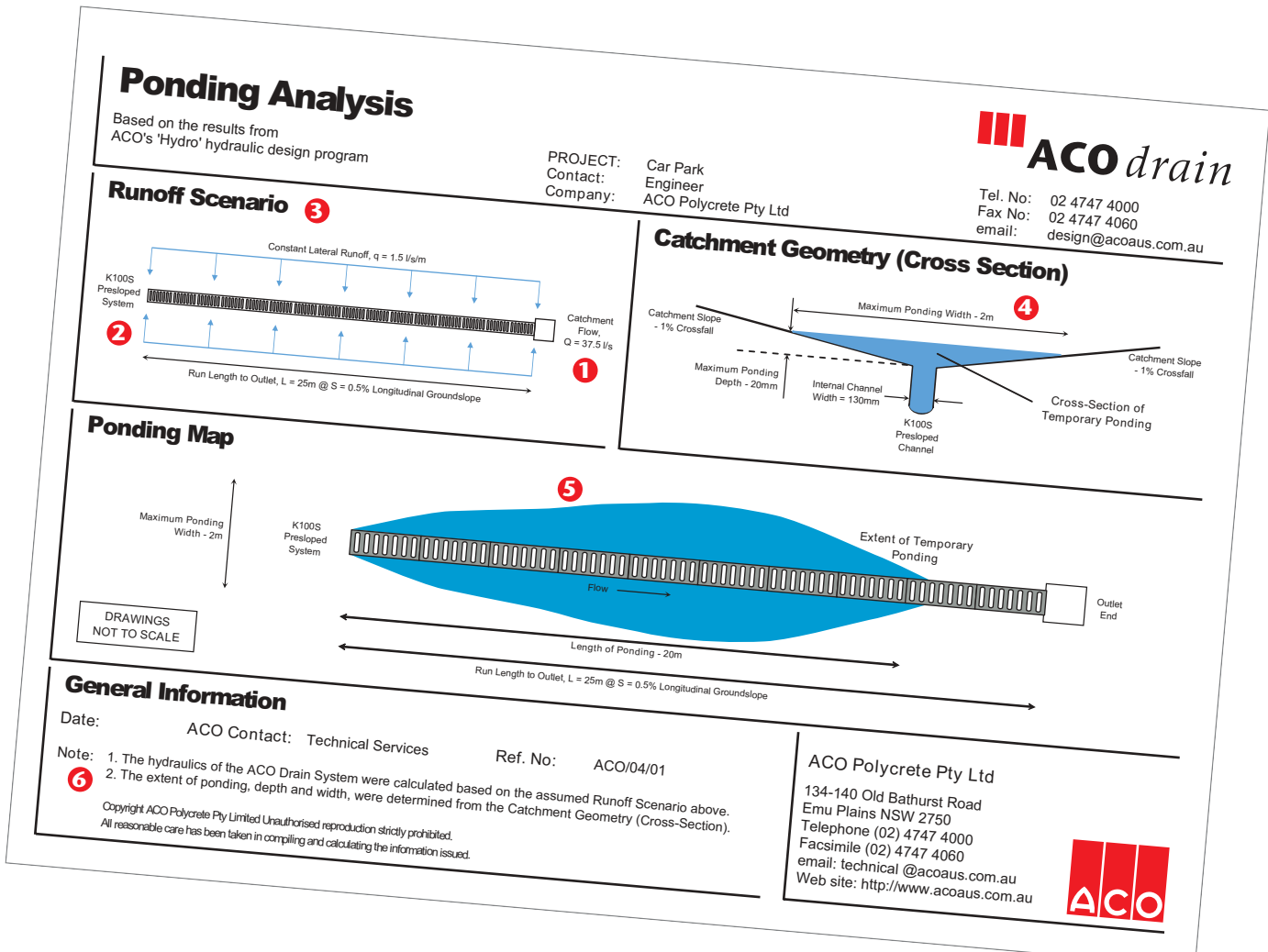
- Full information required to run the 'Hydro' plot - see page 74
- Plan of site showing elevations
- Existence of any buildings
- Perpendicular approach slopes to trench (%)

Results provided are:

- Plot showing extent of ponding; width and depths

Ponding analysis shows:

- 1 Design discharge
- 2 Trench drain size and type
- 3 Run-off scenario
- 4 Width of temporary ponding
- 5 Visual map of worst ponding scenario
- 6 Project notes



5. Chemical resistance

ACO Drain channel bodies are highly resistant to chemical attack and, with the appropriate grate, can be used in most environments where acids and dilute alkalis are encountered. Refer to chemical chart below. Standard products are manufactured using polyester resin. When greater chemical resistance is required, vinylester channels are available to special order, contact ACO for details.

These recommendations are for guidance only. Customers are advised to test a sample of polymer concrete to ensure suitability. Test samples are available free of charge from ACO.

Chemical Medium	Max. conc..	Short exposure	Long exposure	Max. conc..	Short exposure	Long exposure
		72 hours	42 days		72 hours	42 days
Polyester				Vinyl ester		
Acetic Acid	30%	✓	✗	75%	✓	✓
Acetone	10%	✓	✗	10%	✓	✗
Ammonia	10%	✓	✗	10%	✓	✗
Aniline	100%	✓	✗	100%	✓	✗
Aniline in Ethyl Alcohol	10%	✓	✗	10%	✓	✓
Benzene	100%	✓	✗	100%	✓	✗
Boric Acid	100%	✓	✓	100%	✓	✓
Butyric Acid	25%	✓	✓	50%	✓	✓
Butyl Alcohol	100%	✓	✓	100%	✓	✓
Calcium Chloride	100%	✓	✓	100%	✓	✓
Calcium Hydroxide	100%	✓	✗	100%	✓	✓
Caster Oil	100%	✓	✓	100%	✓	✓
Chloric Acid	5%	✓	✗	5%	✓	✓
Chromic Acid	5%	✓	✓	20%	✓	✓
Citric Acid	100%	✓	✓	100%	✓	✓
Diesel Fuel	100%	✓	✓	100%	✓	✓
Ethanol	100%	✓	✗	95%	✓	✓
Ethlendiamine	100%	✓	✓	100%	✓	✓
Ethyl Acetate	100%	✓	✗	100%	✓	✗
Ferrous Sulfate	30%	✓	✓	100%	✓	✓
Fluoralic Acid	10%	✓	✓	10%	✓	✓
Formaldehyde	35%	✓	✓	100%	✓	✓
Formic Acid	10%	✓	✗	10%	✓	✓
Fuel Oil	100%	✓	✓	100%	✓	✓
n-Heptane	100%	✓	✓	100%	✓	✓
n-Hexane	100%	✓	✓	100%	✓	✓
Hydraulic Oil	100%	✓	✓	100%	✓	✓
Hydrochloric Acid	10%	✓	✓	37%	✓	✓
Hydrofluoric Acid	5%	✓	✗	20%	✓	✓
JP4	100%	✓	✓	100%	✓	✓
JP8	100%	✓	✓	100%	✓	✓
Lactic Acid	10%	✓	✓	100%	✓	✓
Methanol	5%	✗	✗	5%	✓	✗
Methyl Amine	100%	✓	✗	100%	✓	✗
Methyl Ethyl Ketone	100%	✓	✗	100%	✓	✗
Mineral Oil SAE5W50	100%	✓	✓	100%	✓	✓
Monochlor Benzene	0.05%	✗	✗	0.05%	✓	✓
Monochloroacetic Acid	10%	✓	✓	10%	✓	✓
Nitric Acid	10%	✓	✗	20%	✓	✓
n-Nonane	100%	✓	✓	100%	✓	✓
Iso-Octane	100%	✓	✗	100%	✓	✗
Oxalic Acid	100%	✓	✓	100%	✓	✓
Petrol	100%	✓	✓	100%	✓	✓
Phenol	100%	✓	✗	100%	✓	✗
Phosphoric Acid	10%	✓	✓	75%	✓	✓
Potassium Hydroxide	10%	✗	✗	10%	✓	✓
Sodium Acetate	100%	✓	✗	100%	✓	✓
Sodium Carbonate	20%	✓	✓	35%	✓	✓
Sodium Chloride	100%	✓	✓	100%	✓	✓
Sodium Hydroxide	15%	✓	✗	25%	✓	✓
Sodium Hypochloric	5%	✓	✓	5%	✓	✓
Sulfuric Acid	40%	✓	✓	70%	✓	✓
Tetrafluoroborsaur	20%	✓	✗	20%	✓	✓
Toluene	100%	✓	✗	100%	✓	✗
Trichloroethylene	100%	✗	✗	100%	✗	✗
Triethylamine	100%	✓	✓	100%	✓	✓
Xylene	100%	✓	✗	100%	✓	✗

Note: Maximum operating temperature of 82°C



Important considerations for chemical environments

When reviewing potential applications of trench drains in chemical environments, the following issues should be considered;

1. Type(s) of chemical(s), including mixture composition %.
2. Concentration percentages.
3. Contact time with trench system.
4. Temperatures of chemicals flowing into the trench drain. (82°C max).
5. Flushing system employed to clear chemicals from the system.
6. Cleaning agents should be checked for compatibility with trench materials.
7. Test samples can be used for final determination of chemical resistance.
8. Grate, locking mechanism, edge rail, outlet and trash basket materials should be checked for chemical resistance.
9. Check sealant for compatibility, if applicable.

If ACO Drain products are unable to provide adequate chemical resistance, refer to ACO Stainless trough and gully products.