

XP-Rat2000

for Microsoft Windows 95/98/NT

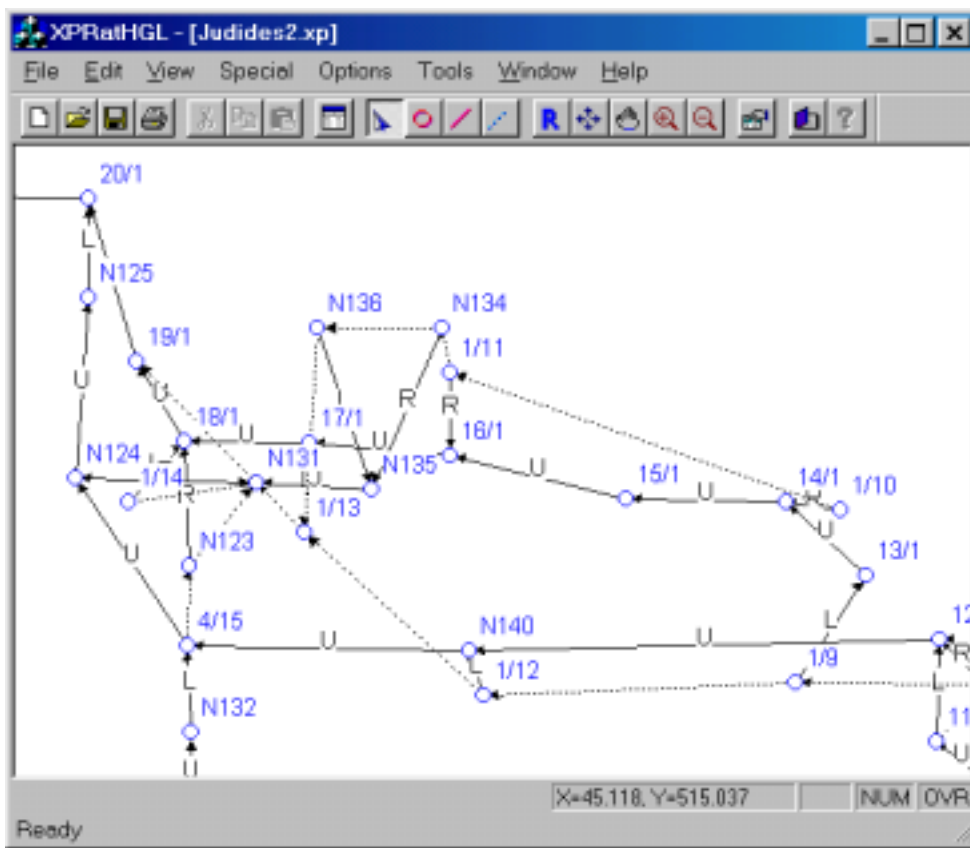
Technical Description

Graphical Expert Environment (XP)

The graphical EXPERT environment, (XP), is a friendly, graphics based environment utilised by a range of software offered by XP Software. It encompasses data entry, run-time graphics and post-processing of results in graphical form.

significant effort to the mechanical tasks of entering and checking data, getting a program to run and interpreting reams of output.

XP-Rat2000 will revolutionise your Urban Stormwater Drainage practice. The program allows you to quickly and confidently create and solve your drainage network. You will have answers in hours instead of days.



With XP-Rat2000 the EXPERT shell acts as an interpreter between the user and the model in the classical style of an embedded expert system. The environment incorporates both pre- and post-processors which use the expert knowledge of experienced users to filter the input data and to create and interpret a valid and reasonable model of the system being simulated.

XP-Rat2000 allows you to work with your CAD drawings to create a scaled view of the drainage basin being considered. A detailed base map may be used and the drainage network created as a layer on top of this map. Base maps may be used from every major CAD package.

Overview

XP-Rat2000 is a link-node model. It performs Rational Formula Hydrology and Hydraulic Grade Line computations to design and analyse urban pipe

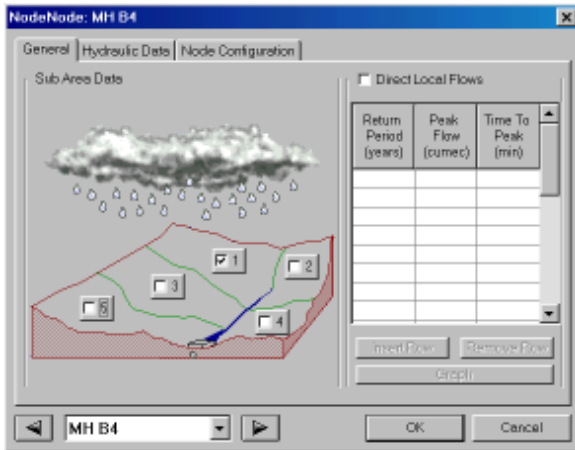
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XP-Rat2000

drainage networks for both stormwater and wastewater.

The nodes and links are created interactively on-screen with a mouse or may be read in from an ASCII text file. The nodes represent surface entry manholes and the links represent hydraulic elements. These may be circular or non-circular conduits or overland (surface) flow paths for diversion of flow which either cannot enter the underground conveyance system or which floods out of it.

Up to 5 watersheds may be defined at each node. Each of these watersheds may have the Time of concentration calculated using a different procedure. They may also have their own Runoff 'C' value as well as differing amounts of impervious area.



XP-Rat2000 is effective in the following fields:

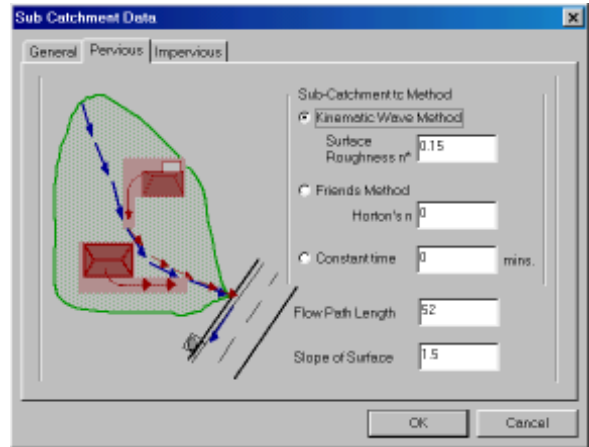
- Design of new stormwater and sanitary drainage systems.
- Analysis of existing stormwater and sanitary drainage systems.
- Major/minor stormwater drainage systems.
- Subdivision drainage design.
- Checking of drainage designs.

Hydrology

XP-Rat2000 uses either the Rational Formula or user-defined flows to compute the peak flows at the manholes of the drainage system.

Time of Concentration

The Time of Concentration for each individual sub-watershed is either computed from standard equations or entered directly by the user. XP-Rat2000 completes exhaustive partial area calculations to determine the Critical Time of Concentration at each manhole in the system. This ensures that each pipe reach is designed or analysed for its worst case (ie., critical storm).

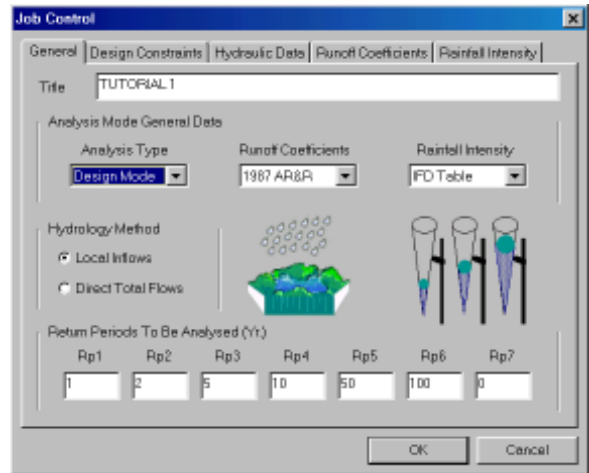


Runoff Coefficient

The Runoff Coefficient is defined for each of the sub-watersheds as a constant value or calculated in accordance with AR&R 1987 or AR&R 1977.

Rainfall Intensity

The rainfall intensity is calculated from the IFD table defined by the user or calculated in accordance with AR&R 1987 or AR&R 1977. Intensities for any duration and return period may be entered and up to seven design storms may be computed in one pass.



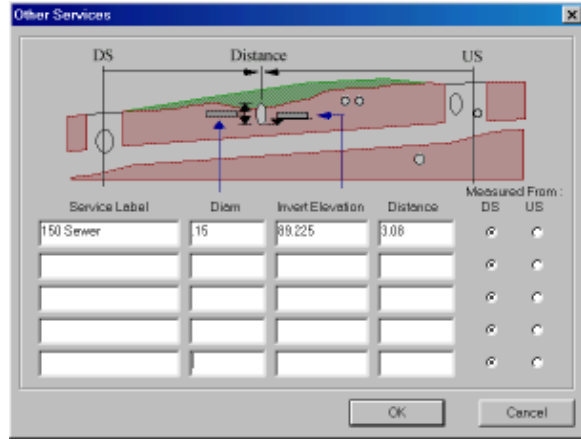
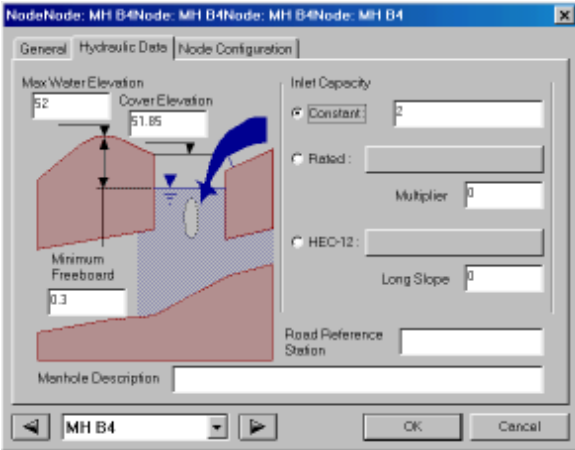
Hydraulics

Hydraulic Grade Line (HGL)

A comprehensive iterative solution to the HGL is provided which completely balances the entire drainage system. This enables XP-Rat2000 to accurately compute surface flow bypasses and re-routing of flooded flows along user-defined surface flow paths.

The flows computed in the hydrology enter the system at the manholes. A user-defined rating curve may be used to determine the quantity of flow entering the underground pipe system and the quantity which bypasses this manhole and flows via a surface route to a downstream location.

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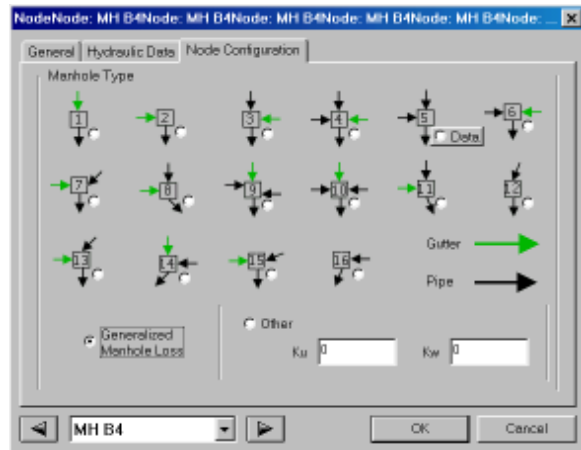
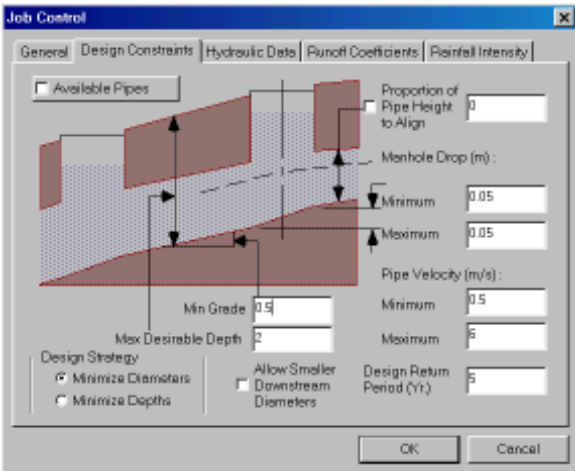
Design

XP-Rat2000 gives the user maximum control over design. The user may modify any of the design rules to achieve an optimum design for the pipe drainage system. You may match obverts, inverts or anywhere in between.

Conflicts with cover or services will be automatically located. The user may control the availability of the various pipe sizes for design purposes and may set the standard sizes which will be available for computer

The pit pressure change coefficient or K value is a coefficient used with the velocity head to determine the energy loss caused by the manhole. The user may select from 16 standard manhole configurations or enter their own values directly.

These losses are modified dynamically by XP-Rat2000 to account for changes in submergence, flow and diameter ratios. In addition, you may also select the Hare/O'Loughlin Generalised Junction Loss



selection.

Conduits

XP-Rat2000 allows for both circular and non-circular underground conduits as well as surface flow paths to be analysed. The time of travel is computed for the flow in the pipes and set by the user for the overflow locations. More than one conduit may be defined in a single link for both design and analysis.

Procedure.

Importing Data

Data may be imported from an ASCII text file in the XPX file format. This format allows the user to create new data and objects as well as update and add to existing XP-Rat2000 networks. This facility may be used to import information from GIS's, FIS's, CAD packages and other databases.

Energy Losses

The minor losses in the drainage system may be defined at the manholes as well as at intermediate points in the conduits to account for bends, grade changes and obstructions in the drainage system.

Plan drawings may be imported from virtually any CAD package or GIS to be used as a scaled base map. An example of this may be seen on page one of this document.

Output

XP-Rat2000

XP-Rat2000 provides results and data in various forms. All graphical displays may be output to printers, plotters or to DXF files.

Graphical Output

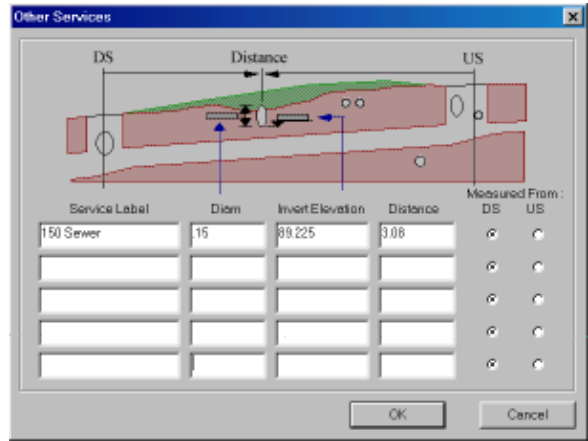
Each pipe reach may be graphed showing flow, velocity, upstream and downstream water levels and HGL's, Invert elevations, friction slope, etc., for every return period that has been analysed.

Long-section profiles may be generated for any part of the drainage system and plotted or printed to scale showing the HGL and any data or results.

Location of various underground services may be shown to scale on these drawings. Up to 5 services may be defined for every reach of pipe in the system.

Scaled plan drawings may be generated showing both the drainage network and any base plan which has been used as well.

All output may be generated for printers, plotters or DXF files.

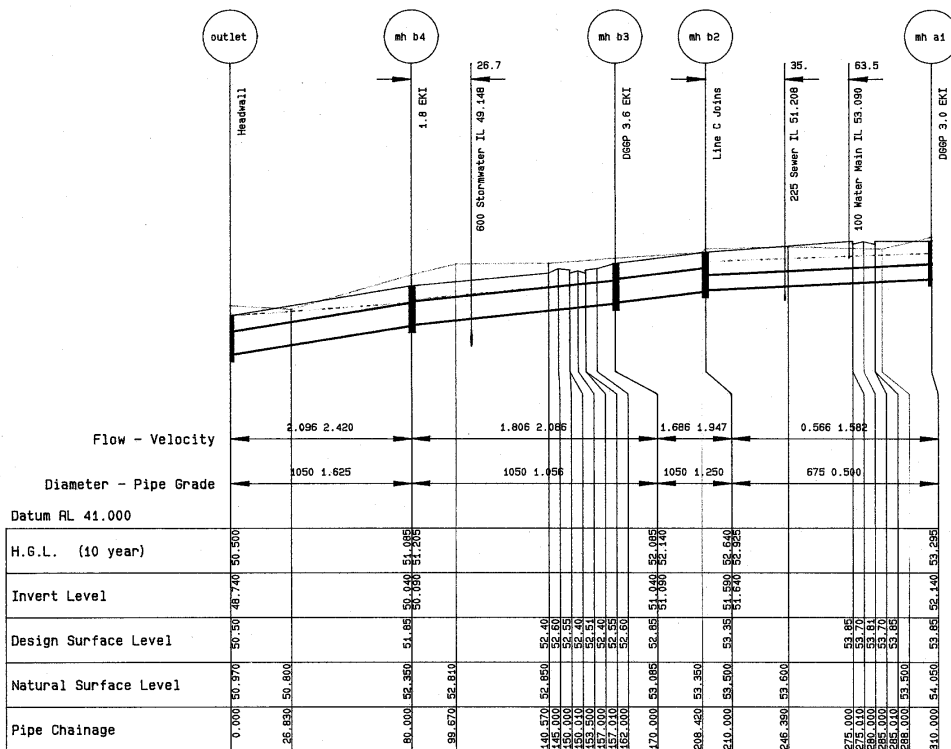


Tabular Reports

Comprehensive **fully editable** tabular reports may be generated for both the hydrology and the hydraulic results and data.

In addition to the formatted tabular reports, an ASCII text output file is available with detailed information on both the hydrology and the hydraulic calculations.

You may define your own reports using our customisable report generation. Any data or results may be included in this report. As well as output to printers, plotters and DXF files, you may also copy and paste data and results between XP-Rat2000 and spreadsheets or databases.



LINE A