

## **Audit and check of the product CIVIL Design**

CIVIL Design is a program which uses AutoCAD/BricsCAD as cad platform with the first edition released in 1992. Nowadays the current version is n. 13.

The product is configured as a set of tools (commands) which supports the user in order to realize designs about roads, railways, quarries, waste disposals, aqueducts, sewers and more in general, for every operation in the land.

The production of new versions complains the realization of many activities which, synthetically, are:

- Planning the new version which begins from a review of the proposals from internal (inside designers) or external customers (customers, consulting)
- Definition of new functions;
- Implementation of new functions;
- Realization of a prerelease version, called alfa version;
- Testing the alfa version and correction of eventual errors;
- Realization of second prerelease version, called beta version;
- Testing the beta version (with the help of external beta testers) and actions in order to correct eventual errors;
- Release the new version to the beta testers;
- Archiving the version;
- Creation of the package;
- distribution;
- maintenance;

Without focusing on the details of any single activity, in the following we describe the most important activities which ensure the correctness of the results in CIVIL Design:

### **Realization of new functions:**

The new functions can include:

- the realization of new commands;
- the modification of existing commands;
- the integration of new functions in existing commands.

In all these cases when the software analyst/developer adopts mathematical algorithms or applies geometric controls defined by norms, creates a calculation simulation with an excel sheet or, if the implemented function is a graphical type, checks the result with tables and rules of the reference norm.

The verification of the result correctness/reliability is confirmed later by the beta testers before the release of the customer version.

### **Release test of the new version**

The tests realized before the final release of a product version follow the specifications of an Operative Instruction of the Quality Management System which conforms the specifications of the norm UNI EN ISO 9001 – 2015.

The used Operative Instruction describes the test coordination and the sequence of the operations to be executed.

The tests realized before the final release of a product version concern different aspects and, synthetically, are:

- the version installation;
- run of every single command;
- run of every single function;
- integration check of the function with other interested commands;
- result checks with:
  - comparison with previous correct samples
  - comparison with a manual drawing of the result
  - comparison with calculation tables in excel sheets
- completeness of the online guide
- test usage by beta tester customers

### **Maintenance**

The product is continuously controlled and the Quality Management System manages with specific instructions the errors, which can be reported by the customers, with the assistance service, as well as by the internal designers. The correction of the errors are published to the customers in the firm site. Moreover the customers will receive the corrections, packaged in a service pack, with the procedure of the automatic update present in the product.

### **Bibliographic reference of the adopted algorithms**

The implemented algorithms used in CIVIL Design originate from public texts as you can see in the following. The material is subdivided per Solution:

### Solution Watersheds:

The adopted methodology and the calculations come from: "Sistemazione dei Corsi d'acqua" authors: Da Deppo, Datei, Salandin, publisher CORTINA.

### Solution - Sewers:

- White Water – samples from "Esercitazioni di Costruzioni Idrauliche" di: Becciu – Paoletti, publisher CEDAM
- Black Water – calculation methodology from the text: "Fognature", authors Da Deppo, Datei, publisher CORTINA.
- Uniform Flow – manual verification

### Solution Roads and Railways:

- Roads - methodology and samples from "Ingegneria Stradale – Geometria e progetto di strade", authors: Ferrari, Giannini, publisher ISEDI
- Roads – DM 05/11/2001 "norme funzionali e geometriche per la costruzione delle strade"
- Roads - DM 19/04/2006 "norme funzionali e geometriche per la costruzione delle intersezioni stradali"
- ICTAAL from SETRA (France)
- AASHTO 2011 norms from American Association of State and Highway Transportation Officials (USA)
- Railways – Technical Norm of Railway Alignments RFI TCAR IT AR 01 001 A
- Railways – Technical Norm of Railway Alignments RFI TCAR IT AR 01 002 A
- Railways – Technical Norm of Railway Alignments RFI DTCSI M AR 01 001 1 A