PLE-micro-CAD version 3.07.12

PLE-micro-CAD has been adapted and extended while some imperfections have been corrected resulting in version 3.07.12.

The module M (non-linear elasto-plastic material behaviour) has been tested extensively and is now considered to be completed. The final verification report composed by Expert Design Systems is expected to be ready in February 2000. Then the module M will be propounded to the certifying authority: the Province of South-Holland.

The program is completely millennium proof as from version 3.07.09. The year within the dates is indicated with 4 digits both on the screen and in the printed and plotted output.

The existing modules of version 3.07 have been modified and extended as follows (see also attached review of Help Screens being modified and related documentation for the User Manuals).

SN009.0 *General functions*

- In view of QA considerations the settings reported in the STATUS table have been extended. Except for the version number the module configuration is recorded too. If the WARNING table exists, the occurrence number is mentioned.

SN009.1 *Graphical functions*

- When drawing the horizontal alignment (H-ALIGN) the orientation of the universal coordinate system (Xu – Yu) is added if different from the pipeline coordinate system (i.e. ANGLE ≠ 0.)

SN009.2 *Function 2: Compose pipeline configuration*

- When specifying a Tee in table TEECONF it should be noted that the length of the run of the tee is equal to the half of the total run length, so the distance from the intersection point of branch and run to the ends of the run.

SN009.3 *Function 3.1: Compose pipe data model*

- A number of function errors (E310/9 and /10) and warnings (W310/6 up to 9) regarding the dimensions of tees have been added. Specification of a Welded-on tee (weldolet) is possible now.
- The Help screens of table ISTROP contain a more precise explanation and description of the check strain (CHKEPS) and the available stress-strain diagrams for plastic calculations.
- Column CHKEPS has been added to result table PIPEMAT resulting in a different table lay-out.

SN009.4 *Function 5: Determine pipeline behaviour*

- The stress intensification factors for the Welded-on tee are calculated in accordance with Appendix E of ASME B31.8 and reported in tabel TEEFAC. The stress components due to the bending moments in the tee (SXUB1) are multiplied by the present stress intensification factors.

SN009.5 *Function 6.1: Compose cross-section data model*

- The 'ADDCROS' mechanism has been adapted in accordance with the treatment of the loads on the cross-sectional ring as described in chapter 6.7 of the Theoretical Manual. If a gap occurs under the pipeline due to an upward movement of the pipe with regard to the soil, it is checked whether the load on top of the pipe (SOILNB + TOPLOAD) exceeds the present soil reaction (reported in result table SOILREA). If so, then the difference is applied as additional loading on the pipeline and additional displacements (ADD.U-Z), bending moments and soil reactions are calculated and reported in table ADDCROS. The criterion for occurrence of a gap under the pipeline is:

  $$(U\text{-}Z) - SETLZ*F - (SOILNB+TOPLOAD)/KLS > 0$$

  So the vertical displacement of the pipe less the vertical settlement less the initial elastic impression of the subsoil due to the present top load has to be positive for a gap to occur. However, it is possible that the gap disappears again due to the occurring additional displacement ADD.U-Z. This phenomenon is taken into account.

SN009.6 *Function 6.2 - 6.5: Perform cross-section calculations*

- In case of elasto-plastic calculations a special design function screen with dedicated stress and strain result tables is available (DF 622).
- In case of elasto-plastic calculations the following warnings can be encountered:
  1. the calculated equivalent strain (eEqS-M) exceeds the check strain CHKEPS specified in input tabel ISTROP.
  2. the calculated buckling strain due to the axial compressive force exceeds the critical one.
  3. the calculated compressive strain in circumferential direction due to (external) overpressure exceeds the critical one.
- The heading of tables SMAXNEN and STRSNEN has been adapted because of possible confusion among program users and certifying authorities. The column names for SV2 up to SV4 inclusive have been provided with the factor 1.5, because these stresses are divided by 1.5 times the yield stress Reb.
  See NEN 3650.