*Sorin ALDEA, Radu Dan RUGESCU*

# *FOR A UNIFORM SYSTEM OF GRADING AND DESIGNATION IN DESCRIPTIVE GEOMETRY*

***Abstract:*** *A general approach to a systems of symbols used in descriptive geometry is proposed. This is seen as the starting point of a discussion on the necessity of agreeing on a unitary system which would be both logical and efficient. This system could be used both in the teaching process and in current engineering applications, especially those carried out on computers. Such a unitary system has be come a matter of utmost necessity once the information sources and the possibilities of dissemination have diversified, in on ever larger context.*

***Key words:*** *notare, simbolizare, geometrie descriptivă, sistem de notații*

## 1 INTRODUCTION

In this presentation a comprehensive approach is proposed for the designations in the descriptive geometry, as an initiative upon the opportunity to establish a unitary system of notation, logic and operational, through which the learner would be exempted from the excessive effort of assimilating several conventions, or manners of notation, or to uselessly consume its time to identify of notations, in the more frequent case of accessing a varied bibliography.

Along the assimilation process of the descriptive geometry, next to the basic content of the taught material, the formalism of presentation (notations, symbols, terminology) could substantially influence the level of training, regarding the duration of the learning process and the clarity of the understanding too.

Graphical images in the descriptive geometry are accompanied by notations of the operating graphical elements, of the referential or by indicators of the operators which are used. However, while the descriptive graphical operations are of irrefutable simplicity, the terminology and notations, through their diversity, often produce a confusing effect, at least for the beginner in learning the descriptive geometry.

Along the times, lots of mathematicians, strongly involved with the descriptive geometry, tried to structure, in a unitary manner, and simplify the notation and terminology. Prestigious specialists, creators of schools, have authored series of attempts to provide a unitary symbolization in the descriptive geometry, without a total finalization, fact that preserves this preoccupation as actual.

At present time, due to the growing weight of the personal training for the professional formation, with a large diversity and lots of publications, a simple, formal presentation reduces the time of study, otherwise wasted with the identification and decoding of different notations, or for the useless learning of various inscribing conventions.

An explanation of the failure in defining the terminology and notation is, sometimes, the non-inspired or approximate translation, from language to language, during the information transfer, or the wrong sampling, with deformed meaning, of periphrasal expressions. Regarding the notations, they were quite often imposed by the printing technology. More recently, they are rather imposed by the drawing techniques used for executing graphical images, manually or automatic, fact that involves formal restrictions too.

The perpetual openess of the educational process for more and more extended areas of information is currently implying the fundation of a conventional system of notation and symbolistic, generally valid, and overpassing the linguistic barrier.

The proposals from the present work are based on a comprehensive documentation, statistical evaluation and longtime exploitation of the proposed designating system, within the didactic activity of the author as professor with the Department of Engineering Graphics and Industrial Design from the Faculty of Aerospace Engineering of Politehnica University in Bucharest. The Bibliography is a mere resumee of the consulted titles, consisting of peculiar notation and symbols, along the times and over diverse spheres of professional influence. The majority of the proposed symbols are rather usual, currently used in mathematics, or specific to the descriptive geometry, traditionally used in the Romanian school of engineering, of French origin, where the descriptive geometry is basic.

In those situations where no established symbols or notations were identified, or when they found no general conveyance, the author proposes a series of new symbols and notations, highlighted through the table in borders. In other cases, the extension of the area of regular use of known symbols is proposed. The author considers as useless to largely present and argue the opportunity of these notations, as far as they are eloquent by themselves. Among the proposed symbols, a distinct position have those referring to the projection transforms, which currently require text explanation. Symbols regarding the denomination of some geometrical transforms are also proposed, with utilization in the descriptive geometry, as for the notation of projections resulting from projection transforms, too.

The advantage presented by a unitary system of notation are obvious, advocating for their use by specialists, especially for those in the higher, technical education in universities, with the recommendation to approach, within periodical, professional meetings, the

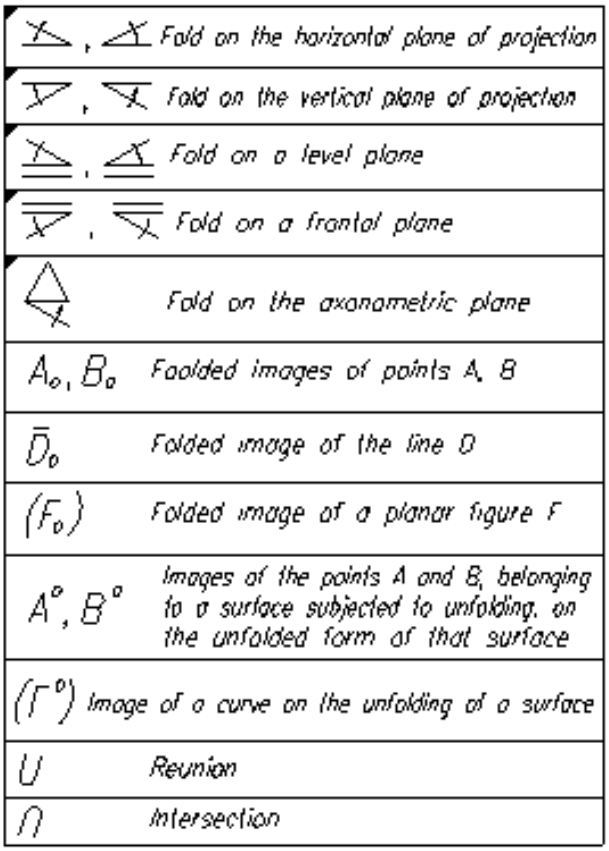
item of terminology unification, specific to engineering graphics, in order to reduce the effort for its assimilation.

The matter here presented could be considered a starting point of a process of defining the frame for a unitary system of notations, logical, self-speaking and operational, and a unitary terminology, formal components for use in the didactic process and in the editing of professional handbooks in the field of descriptive geometry, and of the engineering graphics in general.

**2. SYMBOLS**

| | |
|---|---|
| $\dot{A}$ $A$ | Point in space |
| $a'\ a',\ a''$ | Horizontal, vertical and lateral projections of a point A (projections of the point in the drough) |
| $m_x, m_y, m_z$ | Projections of a point M on the axes $\bar{Ox}$, $\bar{Oy}$ and $\bar{Oz}$ of the reference system into the drough |
| $\bar{D}$ , $(D)$ | Straight line in space |
| $\bar{d}, \bar{d}', \bar{d}''$ | Horizontal, vertical and lateral projections of a line (projections of a line in the drough) |
| $\overline{AB}$ | Segment with A and B ends in space |
| $\overline{ab}, \overline{a'b'}, \overline{a''b''}$ | Projections of a segment with A and B ends in the drough |
| $[P]$ | Designation of a plane in space |
| $[\bar{D}_1, \bar{D}_2]$ | Designation of a plane in space defined by the lines $\bar{D}_1$ and $\bar{D}_2$ |
| $[\dot{A}, \dot{B}, \dot{C}]$ | Designation of a plane defined by the non-colinear points A,B,C |
| $\bar{P}, \bar{P}', \bar{P}''$ | Horizontal, vertical and lateral traces of the plan [P] |
| $A\vdash B, B\vdash A$ | The distance between points A and B in space |
| $A \dashv \bar{D}$ | The distance between the point A and line $\bar{D}$ in space |
| $\sphericalangle(\bar{D}_1, \bar{D}_2)$ | Angle between the concurent lines $D_1$ and $D_2$ in space |
| $\sphericalangle(\bar{D}_1, \bar{D}_2)(\bar{D}_1 \dashv\vdash \bar{D}_2)$ | Angle between the disjoint lines $\bar{D}_1$ and $\bar{D}_2$ in space |
| $\sphericalangle(\bar{D}_1, [P])$ | Angle between the line $\bar{D}$ and the plane [P] in space |
| $\sphericalangle([P], [Q])$ | The angle between the planes [P] and [Q] |
| $l_{\overline{AB}}$ | The length of segment $\overline{AB}$ |

| | |
|---|---|
| $(\Sigma)$ | Designation of a surface in space |
| $(\Gamma)$ | Designation of a curve in space |
| $(\gamma), (\gamma'), (\gamma'')$ | Horizontal,vertical and lateral projections of a curve $(\Gamma)$ |
| $[H]-[H_1]$ | Change of the horizontal, projection plane |
| $[V]-[V_1]$ | Change of the vertical, projection plane |
| $[H]-[H_1]\cup[V]-[V_1]$ Change of the orizontal, projection plane,followed by a change in the vertical, projection plane | |
| $[V]-[V_1]\cup[H]-[H_1]$ Change of the vertical, projection plane followed by a change in the horizontal, projection plane | |
| $A,A'\frac{[H]-[H_1]}{}A_1,A_1'$ A by changing the orizontal, projection plane | Transformation of the projections of a point |
| $A,A'\frac{[V]-[V_1]}{}A,A_1'$ A by changing the vertical projection plane | Transformation of the projections of a point |
| $A,A'\frac{[H]-[H_1]}{[V]-[V_1]}A_1,A_1'$ by a double change of the projection planes, performed in horizontal-vertical order | Transformation of the projections of a point A |
| $A,A'\frac{[V]-[V_1]}{[H]-[H_1]}A_1,A_1'$ by a double change of the projection planes, performed in vertical-horizontal order | Transformation of the projections of a point A |
| | Level rotation |
| | Frontal rotation |
| | Double rotation, front and level rotation orderly |
| | Double rotation, lever and front rotation orderly |
| | Profile rotation |
| $A_r, A_r', A_r''$ | Projections of a point A after rotation |
| $A_{rr}, A_{rr}', A_{rr}''$ | Projections of a point A after two succesive rotations |




**3. CONCLUSION**

The descriptive geometry is preserving itself like a central reference in engineers' training, by formatting the capacity of understanding and modeling technical shapes and by acquiring the ability to express and communicate shape description, within the process of manufacturing.

In the didactic process of assimilation of the descriptive geometry, as a component of graphical engineering, a comprehensive and unitary system of notations would lead to benefic effects. Establishment of such a system is in charge of a wide circle of specialists, as a result of the didactic experience and of a correct interpretation of present tendencies in the realm of graphycal engineering.

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**Authors:**
**Sorin ALDEA**, Ph.D., Professor, Department of Engineering Graphics and Industrial Design, University POLITEHNICA of Bucharest, Romania.
E-mail: sorald@hotmail.com
**Radu Dan Rugescu**, Ph.D., Professor, University Politehnica of Bucharest, Space Technology Division President of ADDA, Association Dedicated to Development in Astronautics.
rugescu@yahoo.com