Comments and suggestions to

International Standard ISO 3002/1 “Basic quantities in cutting and grinding – Part1: Geometry of the active part of cutting tools – General terms, reference systems, tool and working angles, chip breakers

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The objective of the standard is not written in clear and effective language starting from the first sentence: “This Part of ISO 3002 defines a nomenclature for certain basic concepts concerning cutting tools; it is applicable to the geometry of any kind of cutting tool and emphasizes a known terminology for them which is intended to provide a framework on which the nomenclature and appropriate standards for individual types of cutting tool, such as single-points tools, twist drills, milling cutters and hand tools, can be established.” First of all, what does it mean “a nomenclature for basic concepts concerning cutting tools”? It is simply nonsense because a concept has no nomenclature. Moreover, a concept is not defined by a standard. Besides, the standard doe not contain ANY concept at all. Second, putting two “which” in one sentence is not good language. Third – what is “single-points tools”? It is it single then should be point. In any case, even “multi-point” is without “s”.

The major problem with the objective, however, is its complete failure to answer a simple yet the most important question: “Why one should know the tool geometry?” The educated and thus complete answer to this question is not simple and straightforward. The simples answer can be thought of as follows: “To be able to reproduce THE SAME tool geometry from one tool re-sharpening to another, from one cutting insert to the next, etc” so that it should be stated as such in the standard. This is because the modern stage of development of metal cutting is not sufficient to answer on the simple questions as: “What the tool geometry for a given application should be selected?”; “What tool geometry should be to assure: (a)maximum tool life, (b)maximum productivity, (c) minimum cost, etc.?” Therefore, the optimum tool geometry for a give application is a mater of experimental finding although no proper methodology to do such experiments is readily available.

Unfortunately, the theory of metal cutting and the practice of tool design do not require the knowledge on the correlation of the cutting tool geometry and the metal cutting process. The existent “theory of metal cutting,” (which can hardly be called “theory” due to its next to zero prediction ability) includes into consideration only the tool rake angle. Even so, the change in the resistance of the work material and tool life with the rake angle does not follow from this “theory” because it does not analyze the state of stress in the deformation zone depending on the rake angle (although the rake and inclination angles along with other parameters of the tool geometry MUST be considered).

The following comments and suggestions are made in hope that one day the cutting theory may need more accurate definitions of the tool geometry parameters tan those presented in the Standard.

Clause Page	As per Standard	Comments	Proposed
3.2.3, page1	**Tool bore**: the bore in the tool by which it can be fixed by a spindle, arbor or mandrel	Spindle, arbor and mandrel locate but not fix tool bore	Tool bore: the bore in the tool by which it can be located on a spindle, arbor or mandrel
3.2.4, page1	**Tool axis**: An imaginary straight line with defined geometrical relationship to the locating surfaces used for the manufacture and sharpening of the tool and for holding the tool in use.	An axis cannot be used for holding because it is "IMGINARY" straight line	An imaginary straight line with defined geometrical relationship to the locating surfaces used for the manufacture and sharpening of the tool and for locating the cutting part of the tool in use with respect to the directions of prime and feed motions.
3.2.5, Page 1	**Cutting part**: The functional part of parts of the tool each comprised of chip production elements; the cutting edges, face and flank are therefore elements of the cutting part.	"part of parts" is really nice. "Chip production elements" – what flank has to do with that?	Cutting part (cutting tooth) is the cutting wedge enclosed between the tool rake and flank surfaces intersected to form the cutting edge(s).
3.2.6, Page 1	**Base:** A flat surface on the tool shank parallel or perpendicular to the tool reference plane, useful for location or orienting the tool in its manufacture, sharpening and measurement. Not all tools have a clearly defined base.		
3.2.7, Page 1	**Wedge**: The portion of the cutting part enclosed between the face and the flank. It can be associated with either the major or minor cutting edge.		Should be dropped. Corrected close 3.2.5. is sufficient
3.3.1.1, Page 2	**Reduced face** $\overline{A_g}$: A specially prepared surface or surfaces separated from the rest of the face by a step and designed in such a way that the chip contacts only the reduced face.	Reduced compare to what?????? What should be its length $\overline{b_g}$ (Fig. 2c) to be called 'reduced'?	The major problem is that the geometry presented in the Standard does not correlated by any means with the physics or experimental evidences of metal cutting. The term 'reduced face" makes sense if and only if the term 'natural contact length' is properly introduced and defined. As such, the reduced face can be thought of as a face having length less than natural contact length the in the direction of chip sliding.

Clause Page	As per Standard	Comments	Proposed
3.3.2, Page 2	**Flank** A_a : The tool surface or surfaces over which the surface produced on the workpiece passes.	What is that 'the surface produced on the workpiece passes'?	On page 1, clause 3.1 this surface is defined as transient surface (for usual cutting) or machined surface (for orthogonal cutting).
3.4.1, Page2	**Cutting edge**: "That edge of the face which is intended to perform cutting."	The cutting edge belongs to both the face and the flank surfaces. Only in this sense it is clear and have physical meaning.	Should be "Cutting edge is the line of intersection of the face and the flank."
3.4.3, Page 2	**Working cutting edge** S_e : That entire part of the cutting edge which commences at the point where the working cutting edge angle k_{re} is zero and of which at least a portion produces the transient surface on the workpiece.	First, this definition has nothing to do with the term "working". Second, what does it mean: "and of which at least a portion produces the transient surface on the workpiece"? What other part of the working edge is doing?	Redundant – should be abolished as useless. It is sufficient to define the cutting edge, major and minor cutting edges and active cutting edges.
3.4.2, Page 3	**Corner**: The relatively small portion of the cutting edge at the junction of the major and manor cutting edges; it may be curved, straight or the actual intersection of these cutting edges.	Corner is a point so it cannot be "the relatively small part of the cutting edge." Therefore, it CANNOT be curved or straight.	Corner: the point of intersection of the major and the minor cutting edges; this is that point from which the overall (setting)length of the cutting tool is measured (see figure 1)
3.4.2.1, Page 3	**Rounded corner**: A corner having a curved cutting edge.	The corner does not have a CUTTING EDGE because it is a point.	**Rounded corner**: The point of intersection of the major and the minor cutting edges when these edges are not straight in the vicinity of their intersection
3.4.2.2, Page 3	**Chamfered corner**: A corner having a straight cutting edge.	The corner does not have a CUTTING EDGE because it is a point.	**Chamfered corner:** A corner formed by the major and minor cutting edges where the relatively small portion (compare to the length of the active cutting edge)of one of these edges chamfered with smaller cutting edge angle (κ_r or κ_r').

Clause Page	As per Standard	Comments	Proposed
3.4.4, Page 3	Rounded cutting edge: a cutting edge which is formed by a rounded transition between the face, A_γ, and the flank, A_α.	Edge is a line so it cannot be rounded. However, there is no such thing as the perfectly sharp cutting edge. Rather, any cutting edge is a theoretical approximation of the transient curved surface which joints the face and the frank. To the first approximation, the profile (in the normal section plane P_n) of this surface can be approximated by an ark having certain radius, r_c, which is termed as the radius of the cutting edge. Therefore, it is always there. Therefore, only the case when this radius becomes significant should be accounted for. Multiple experimental evidences suggest that considered alone, radius r_c cannot be used to decide is it is significant or not. Rather, the ratio "uncut chip thickness/radius of the cutting edge" has to be considered. If this ratio is equal to or more than 10, then the cutting edge is considered as the perfectly sharp regardless of any particular value of r_c. Otherwise, the cutting edge is called rounded.	Rounded cutting edge: a curved transition surface between the face, A_γ, and the flank, A_α approximated by a cylindrical surface of radius r_c. The cutting edge is considered rounded if and only if this radius is less than 10 times smaller than the minimum uncut chip thickness. Otherwise, the cutting edge is considered as the perfectly sharp regardless of any particular value of r_c.
3.5.1, Page 3	**Corner radius** r_e: The nominal radius of a rounded corner measured in the tool reference plane.	Theoretically, the projection of the curve connecting the major and minor cutting edges is not an ark because the flank angles of the major and the minor cutting edges are not zeros. Technologically, the rib formed at the intersection of the major and minor flanks is rounded (by grinding or forming) in the direction perpendicular to this rib. Therefore, the projection of this curve into the reference plane is a part of an ellipse so to assign a certain radius to this curve, it must be first approximated by an ark. The radius of this approximation ark should be considered as the corner radius r_ε.	**Corner radius** r_e: The radius of the arc approximated the projection into the reference plane of the special curve connecting the major and minor cutting edges.

Clause Page	As per Standard	Comments	Proposed
3.5.4, Page 3	**Rounded cutting edge radius** r_n: The nominal radius of a rounded cutting edge measured in the cutting edge normal plane.	See comments to clause 3.4.4	**Rounded cutting edge radius** r_c: The radius r_c of an arc that approximates the trace of the curved transition surface between the face, A_γ, and the flank, A_α in the cutting edge normal plane.
3.6, Page 8	**Tool and workpiece motions**	It is written without understanding the kinematics of metal cutting. The main "sin" is in the absence of a diagram showing principal kinematic schemes in cutting with corresponding axes and motion with respect to these axes. Unfortunately, this problem cannot be fixed by simple editing the text of the standard.	**Should be completely re-written – no fix.**
3.6.1, Page 8	**Primary motion**: The main motion provided by a machine tool or manually, to cause relative motion between the tool and workpiece so that the face of the tool approaches the workpiece material. In a lathe, this motion is provided by the rotary motion of the workpiece; in drilling and milling machines, it is provided by the rotary motion of the tool; in a planning machine it is provided by the longitudinal motion of the table. The primary motion is only able to cause chip removal for more than one revolution or stroke if there is a feed motion as defined in 3.6.2. Usually, the prime motion absorbs the most total power required to perform a machining operation.	Many errors in English punctuation. For example " manually, to cause relative" – the coma is not needed at all. I am wondering if there was an English technical editor for this standard at all. " the face of the tool approaches the workpiece material." – it has nothing to do with the prime motion. " in a planning machine it is provided by the longitudinal motion of the table." - in planning, table RECIPROCATES. " … the prime motion absorbs the most total power…" – motion DOES NOT absorb power. On the contrary, it requires power to maintain this morion.	