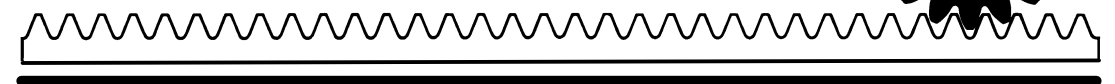


AMERICAN GEAR MANUFACTURERS ASSOCIATION

*Calculation of Bevel Gear Top Land and
Guidance on Cutter Edge Radius*

AGMA 929-A06



AGMA INFORMATION SHEET

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American
Gear

Manufacturers
Association

Calculation of Bevel Gear Top Land and Guidance on Cutter Edge Radius
AGMA 929-A06

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Approved August 22, 2006

ABSTRACT

This information sheet supplements ANSI/AGMA 2005-D03 with calculations for bevel gear top land and guidance for selection of cutter edge radius for determination of tooth geometry. It integrates various publications with modifications to include face hobbing. It adds top land calculations for non-generated manufacturing methods. It is intended to provide assistance in completing the calculations requiring determination of top lands and cutter edge radii for gear capacity in accordance with ANSI/AGMA 2003-B97.

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Contents

| | Page |
|--|------|
| Foreword | iv |
| 1 Scope | 1 |
| 2 Symbols, terminology and definitions | 1 |
| 3 Input data | 5 |
| 4 Calculations | 8 |
| | |
| Bibliography | 38 |

Annexes

| | |
|--|----|
| A Additional equations from ANSI/AGMA 2005-D03 | 18 |
| B Stock allowance and standard cutter specifications | 23 |
| C Spiral bevel example problem | 24 |
| D Hypoid example problem | 31 |

Tables

| | |
|--|---|
| 1 Symbols and terms | 1 |
| 2 Input variables | 6 |
| 3 Symbols and terms from ANSI/AGMA 2005-D03, table 9 | 7 |
| 4 Gear rotation factor, k_E | 7 |
| 5 Suggested defaults for input data | 7 |

Foreword

[The foreword, footnotes and annexes, if any, in this document are provided for informational purposes only and are not to be construed as a part of AGMA Information Sheet 929-A06, *Calculation of Bevel Gear Top Land and Guidance on Cutter Edge Radius.*]

The Bevel Gearing Committee recognized the need for additional equations to aid in the design of bevel gears. The equations for geometry factors found in the annex of ANSI/AGMA 2003-B97 require detailed information on the proposed cutting tool before a proper calculation can be performed. In addition, the minimum top land thickness is required to aid in determining the maximum case depth allowed on carburized bevel gears. The equations required for these values were not published in AGMA documentation, but could be found, for some cases, in the publications listed in the bibliography of this information sheet. AGMA 929-A06 expands on those equations to include gears manufactured with the face hobbing cutting method.

In the case of non-generated gears, the equations in this document may yield different values for pinion top land thicknesses and gear tooth depth at the toe and heel than obtained on some well known commercial software. The pinion top land thickness is reduced by curvature added to the pinion, a natural consequence of the non-generated gear member having no profile curvature on the teeth. For the gear member, the non-generating process cuts a rootline tangent to the gear root cone, a rootline which does not wrap around the root cone as in the generated case. This leaves the toe and heel ends of the tooth slots shallow compared to the generated gear case, and the gear tooth space at the ends of the teeth narrower. The non-generated gear is the imaginary generating gear for the pinion. So the pinion teeth, which fit in the non-generated gear tooth slots, are thinner at the ends than their generated gear counterparts.

The cutter edge radii calculated in this document are based on the geometrical conditions present and include a manufacturing gauging flat. Individual blade manufacturers have standard blade edge radii and manufacturing tolerances for their products which should be considered when sourcing non-standard radii. It is recommended to work closely with the blade supplier to ensure design specifications and sourced product specifications are consistent.

The first draft of AGMA 929-A06 was made in February, 1999. It was approved by the AGMA Technical Division Executive Committee in August, 2006.

Suggestions for improvement of this document will be welcome. They should be sent to the American Gear Manufacturers Association, 500 Montgomery Street, Suite 350, Alexandria, Virginia 22314.

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American Gear Manufacturers Association -

Calculation of Bevel Gear Top Land and Guidance on Cutter Edge Radius

1 Scope

This information sheet provides a set of equations for the calculation of bevel gear top land and guidance on cutter edge radius. It integrates the equations in ANSI/AGMA 2005-D03, *Design Manual for Bevel Gears*, and Gleason publication SD3124B, *Formulas for Cutter Specifications and Tooth Thickness Measurements for Spiral Bevel and Hypoid Gears*, with modifications to include face hobbing, and additions for the top land calculations for

non-generated manufacturing methods, to achieve compatibility between publications.

It is intended to provide assistance in completing the calculations requiring determination of top lands and cutter edge radii in ANSI/AGMA 2003-B97, *Rating the Pitting Resistance and Bending Strength of Generated Straight Bevel, Zerol Bevel and Spiral Bevel Gear Teeth*.

Annexes are provided for additional related information and calculation examples.

2 Symbols, terminology and definitions

2.1 Symbols and terminology

The equations in this information sheet are written in terms generally used for hypoids. See table 1.

For other gears, the nomenclature from ANSI/AGMA 2005-D03, table 9 are used (see table 3).

NOTE: Some of the symbols and terminology contained in this document may differ from those used in other documents and AGMA standards. Users of this standard should assure themselves that they are using the symbols, terminology and definitions in the manner indicated herein.

Table 1 - Symbols and terms

| Symbol | Term | Units | Where first used |
|--------------------|---|-------|------------------|
| A_{iG}, A_{iP} | Inner cone distance, gear or pinion | inch | Eq 7, Eq 1 |
| A_{mG}, A_{mP} | Mean cone distance, gear or pinion | inch | Eq 9, Eq 1 |
| A_{oG}, A_{oP} | Outer cone distance, gear or pinion | inch | Eq 7, Eq 3 |
| A_{xG} | Cone distance for involute lengthwise curvature point where normal circular pitch and slot width is a maximum | inch | Eq 31 |
| a_G, a_P | Mean addendum, gear or pinion | inch | Eq 50, Eq 50 |
| a_{iG}, a_{iP} | Inner addendum, gear or pinion | inch | Eq 78, Eq 77 |
| a'_{iG}, a'_{iP} | Adjusted inner addendum, gear or pinion | inch | Eq 82, Eq 81 |
| a_{oG}, a_{oP} | Outer addendum, gear or pinion | inch | Eq 163, Eq 162 |
| B | Outer normal backlash allowance | inch | Eq 6 |
| b_G, b_P | Mean dedendum, gear or pinion | inch | Eq 19, Eq 22 |
| b_{iG}, b_{iP} | Inner dedendum, gear or pinion | inch | Eq 25, Eq 24 |
| b_{oG}, b_{oP} | Outer dedendum, gear or pinion | inch | Eq 20, Eq 22 |
| b_{xG}, b_{xP} | Dedendum at cone distance A_{xG} , gear or pinion | inch | Eq 44, Eq 45 |
| b'_{oG} | Theoretical outer gear dedendum | inch | Eq 19 |
| c | Clearance | inch | Eq 77 |

(continued)