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American National Standard

Assembling Bevel Gears

American National Standard

Assembling Bevel Gears

ANSI/AGMA 2008-C01

(Revision of ANSI/AGMA 2008-B90)

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ABSTRACT

This Standard was prepared expressly for the assembly man in the factory and for the service man in the field. Each definition, explanation, and instruction is directed toward the physical appearance of the gears as they are inspected and assembled by these personnel. The definitions are simple. The explanations are thorough.

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Table of Contents

Section	Title	Page
1.	Scope	1
2.	Terms and Definitions	1
3.	Application of Bevel Gear Types	
3.1	Straight Bevels	4
3.2	Spiral Bevels	5
3.3	Zero Spiral Bevels	5
3.4	Hypoids	5
4.	General Considerations for Proper Assembly	
4.1	Tooth Contact Pattern	5
4.2	Axial Position Adjustment	6
4.3	Significance of Backlash	7
5.	Examination of Parts	
5.1	Mounting Distance	7
5.2	Backlash	7
5.3	Matched Teeth	7
5.4	Set Number	8
5.5	Part Number	8
5.6	Other Markings	8
5.7	Damage	8
6.	Positioning Bevel Gears	
6.1	Positioning the Pinion	9
6.2	Positioning the Gear	9
6.3	Positioning the Pinion by Setup Gage	9
6.4	Positioning the Pinion by Measurements	10
6.5	Positioning the Pinion by Flush Surfaces of the Back Angle	11
7.	Backlash Check	
7.1	Backlash Correction	17
7.2	Amount of Axial Movement for Change in Backlash	18
7.3	Endplay	18
7.4	Contact Pattern Movement	18
8.	Tooth Contact Patterns	
8.1	Tooth Contact Pattern at Light Load	19
8.2	Full Load Pattern	19
8.3	High or Low Contact Pattern Corrections	19
8.4	Cross Contact Pattern	20
8.5	Toe Tooth Contact Pattern	20
8.6	Heel Tooth Contact Pattern	20
9.	Suggested Assembly Check List	
9.1	Housing	30
9.2	Pinion and Gear	30
9.3	Assembly	30

Table of Contents

Section	Title	Page
Figures		
Fig 2-1	Bevel Gear Nomenclature	2
Fig 2-2	Bevel Gear Mounting Distances	3
Fig 2-3	Bevel Gear Tooth Nomenclature	3
Fig 2-4	Pitch Plane of Gear	4
Fig 3-1	Straight Bevel	5
Fig 3-2	Spiral Bevel	5
Fig 3-3	Zero Spiral Bevel	5
Fig 3-4	Hypoid	5
Fig 4-1	Measurement of Normal Backlash	7
Fig 5-1	Typical Gear Marking	8
Fig 6-1	Hypoid Pinion Mounting Gage	9
Fig 6-2	Pinion Setup Gage for Angular Bevel Gears	10
Fig 6-3	Photograph of Pinion Setup Gage	11
Fig 6-4	Mounted Bevel Gears	11
Fig 6-5	Gears Shown in Fig 6-4	11
Fig 6-6	Shimming Procedure for Bevel Pinion with 90 Degree Shaft Angle	12
Fig 6-7	Typical Gear Box	13
Fig 6-8	Housing-Vertical Mounting Distance	13
Fig 6-9	Vertical Sub-Assembly	14
Fig 6-10	Housing-Horizontal Mounting Distance	14
Fig 6-11	Horizontal Sub-Assembly	15
Fig 6-12	Shimming Procedure for Bevel Pinion with Other Than 90 Degree Shaft Angle	15
Fig 6-13	Angular Bevel Gear Box Housing Mounting Distance Measurements and Calculations	16
Fig 6-14	Positioning of Bevel Gears with Flush Surfaces	16
Fig 7-1	Bevel Gear Backlash, Normal and Transverse	17
Fig 7-2	Axial Movement Per 0.001 in (0.025 mm) Change in Backlash	18
Fig 8-1	Typical Contact Patterns at Correct Mounting Positions	21
Fig 8-2	High Tooth Contact on Pinion - Low Tooth Contact on Gear (Pinion Axial Position Error)	22
Fig 8-3	High Tooth Contact on Gear - Low Tooth Contact on Pinion (Pinion Axial Position Error)	23
Fig 8-4	Lame Tooth Contact (Improper Machining)	24
Fig 8-5	Cross Contact Offset Error, Case 1	25
Fig 8-6	Cross Contact Offset Error, Case 2	26
Fig 8-7	Cross Contact Improper Positioning of One Member	27
Fig 8-8	Toe Contact Shaft Angle Error	28
Fig 8-9	Heel Contact Shaft Angle Error	29
Tables		
Table 4-1	Suggested Normal Backlash Tolerance at Tightest Point of Mesh	6

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 ANSI/AGMA Standard 2008-C01, *Assembling Bevel Gears*.]

Information pertaining to recommended practice in the assembling of bevel gears is not new in the published literature of the American Gear Manufacturers Association. In 1927, the *Recommended Practice of the American Gear Manufacturers Association of Adjustment of Bevel Gears in Assembly* was adopted and published.

This practice was revised in 1940 by the Bevel Gear Committee, but no further revision was undertaken until 1967.

Since the satisfactory performance of bevel gears is closely related to proper installation, it was decided by the Bevel Gearing Committee that it was important to maintain information on this subject in the literature of the Association.

This manual brings up to date and reflects the present thinking on the information given in the original practice.

This manual was prepared expressly for the assembly man in the factory and for the service man in the field. Each definition, explanation, and instruction is directed toward the physical appearance of the gears as they are inspected and assembled by these personnel. The definitions are simple. The explanations are thorough.

Each section devoted to the tooth contact pattern of a particular type of gear is intended to be complete in itself for use as a separate shop manual if desired. For this reason, when the manual is read in its entirety, these sections seem repetitious.

In contrast, the sections devoted to angular gears are brief and general. The committee concluded that each angular configuration requires separate treatment, and that a complete coverage of all of the possible combinations would be impractical if at all possible.

The first draft of AGMA 331.01 was prepared by the Bevel Gearing Committee in October, 1967. It was approved by the AGMA membership and became an official AGMA manual as of August 2, 1969. The manual was reaffirmed in 1976.

AGMA 2008-B90 is a revision of 331.01. It was approved by the AGMA membership on November 10, 1989, and as an American National Standard on May 4, 1990.

An errata was issued in June, 1995 that changed the denominator of the equation for "Transverse Backlash, B_t " in figure 7-1, to reflect the product of the cosine terms, rather than their difference.

ANSI/AGMA 2008-C01 is a correction of ANSI/AGMA 2008-B90. In 2000 an errata revision of clauses 7.2, 8.3.1 and 8.3.2 was balloted. This was approved by the AGMA membership in June 2001 and as an American National Standard on November 20, 2001.

Suggestions for improvement of this standard will be welcome. They should be sent to the American Gear Manufacturers Association, 1500 King Street, Suite 201, Alexandria, Virginia 22314.

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1. Scope

This Standard applies to the assembly of all bevel gears.

The term *bevel* gears is used to mean straight, spiral, and hypoid gear designs. If data pertain to one or more but not all, the specific forms are identified.

The standard provides the following:

(1) A better understanding of the need for correct positioning of bevel gears.

(2) Information necessary for correct assembly and positioning of bevel gears in their respective housings.

(3) Information for methods personnel in establishing detailed assembly procedures for specific applications.

(4) Information for Tooling personnel responsible for equipping an assembly department with the tools and gages necessary for proper assembly.

(5) Instruction to Assembly personnel for obtaining tooth contact patterns, for interpreting the tooth contact patterns, and for adjusting the position of the members to change the tooth contact patterns.

This Manual applies to the assembly of all bevel gears. While certain design considerations and development techniques are mentioned to clarify different aspects, this Manual is not intended as a design guide. It is prepared on the assumption that gears and mountings are designed in accordance with Standard AGMA 2005–B88, *Design Manual for Bevel Gears*.

2. Terms and Definitions

The terms defined in this section are used in subsequent sections of this Manual. The definitions are provided for the assembly or service personnel as an aid in the assembly and visual inspection of the parts. Therefore, they may differ somewhat from the gear engineering definitions which appear in Standard AGMA 112.04, *Nomenclature (Geometry) Terms, Definitions, Symbols, and Abbreviations*.

Bevel gear nomenclature used throughout the standard is illustrated in Figs 2–1, 2–2, 2–3, and 2–4.

Back Angle is the angle between the back cone element and a perpendicular to the gear axis. See Fig 2–1.

Backlash, in an assembled gear set, is the clearance or play between the teeth of the meshing gears. Backlash may be determined by holding the shaft of one member fixed and rotating the shaft of the mate in each direction. This is usually measured at the pitch diameter as a linear distance.

Backlash, Normal is backlash measured along a line perpendicular to the tooth surface.

Backlash, Transverse is backlash measured in the direction of the rotation of the tooth.

Bevel Gear Testing Machine is a machine used to check the tooth contact pattern of a pair of bevel gears while operating at light load at any specific mounting position. If necessary, the gears can be displaced in the machine from their mounting position, the amount of displacement can be measured, and the effect of the displacement on the contact can be evaluated.

Concave Side of the Tooth is the side produced by the outer edge of a circular cutter or grinding wheel. See Fig 2–3.

Convex Side of the Tooth is the side produced by the inner edge of a circular cutter or grinding wheel. See Fig 2–3.

Crossing Point is the point of intersection between the axes of the mating members as viewed along a common perpendicular. See Fig 2–2.

Diametral Pitch is the number of teeth per unit of pitch diameter with the exception of hypoid pinions. (see Module, Transverse)

Flank of the Tooth is the lower portion of the tooth surface. See Fig 2–3.

Gear is the element of a mating pair of gears with the greater number of teeth.

Heel refers to the outer end of the tooth. See Fig 2–3.

Hypoid Offset is the distance between two parallel planes; one containing the gear axis, the other containing the pinion axis of a pair of hypoid gears.