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AutoCAD & CATIA
零件放样规范
(2007.06.01)

AutoCAD & CATIA
Component Lofting Standard
(2007.06.01)

前 言
PREFACE

为适应船舶行业发展需求，公司先后引进了 AutoCAD、CATIA、ERP、FastCAM、SB3DS 等设计与生产辅助软件进行自动化管理，以打造船舶行业中一个高品质、高效率的公司品牌。

With the development of ship-building industry, YRS has made use of CAD and CAM software such as AutoCAD, CATIA, ERP, FastCAM, SB3DS to automate our design and production management for a company with high quality and efficiency.

为实现这一目标，我们需要建立一套设计与生产软件数据接口的统一标准，以此确保相关设计与生产软件之间在数据传输过程中准确便捷，实现部分工作的自动化处理，缓解设计压力，减轻现场工作量，提高施工精度，利于公司后期生产数据管理，真正有效的提高公司整体工作效率及经济效益。

In order to achieve this goal, we need establish a set of unified standards for design and production software data connection, to guarantee accurate and convenient transmission between design and processing data, automation of some repeated work, reduction of design and manufacture workload, improvement of manufacture precision. This benefits our manufacture data management, effectively improves work and economic efficiency.

为满足公司现有及未来一段时期内的设计与生产需求，CATIA V5R18 中将基本实现零件自动放样工作，但公司现在仍主要使用 AutoCAD 进行手工放样，无统一数据标准，为使设计与生产部门在数据传输与使用中得以平稳过渡，现结合技术与生产

人员的建议和经验，在公司原有生产标准基础上归纳编写此规范。

CATIA V5R18 will basically automate component setting-out work in order to meet our requirements for design and production, but we are mainly using AutoCAD to carry on manual lofting work with non-unified standards. For steady transit of data from design department to production department, we summarize technical and production personnel's suggestions and the experience to form the following standard on the basis of YRS present standards.

此规范在公司未来的发展过程中，如需变更，将另行通知。

We will inform you if we modify the standard in the future.

李龙

2007.06.01

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目录

LIST

一、AutoCAD & CATIA 层 （AutoCAD & CATIA Layer）

1.1）层设置（The Layer Setup）

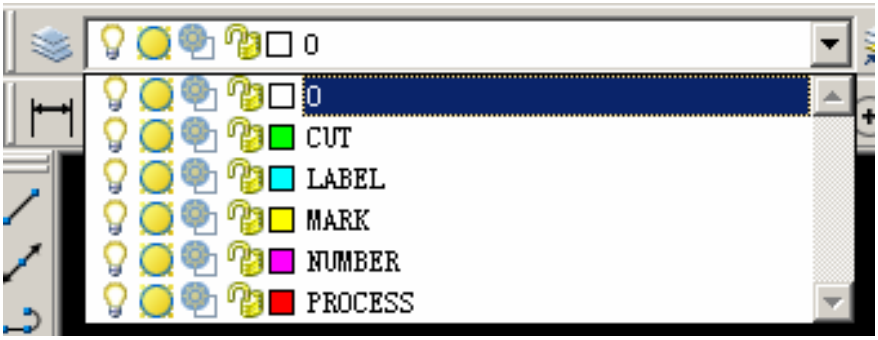
CUT 切割层（Green 绿色）

MARK 喷粉层（Yellow 黄色）

NUMBER 文本层（Magenta 紫色）

PROCESS 加工层（Red 红色）

LABEL 标识层（Cyan 青色）



1.2）层定义（The Layer Definition）

1.2.1）CUT（切割层）仅为需切割的实体；

The CUT layer contains only the entities that we must cut;

1.2.2）MARK（喷粉层）仅为需喷粉的实体（如轧弯、肋位线、待定人孔等）；

The MARK layer contains only the entities that need dusting (for example roll over marking, rib position line, undetermined manhole, etc.);

1.2.3）NUMBER（文本层）仅存放 Part Number（零件名）；

The NUMBER layer only contains the part number;

1.2.4)PROCESS(加工层)仅存放 Bevel(坡口)、Chamfers(削斜)等 Processing Information（加工信息）文本内容；

The PROCESS layer only contains the annotations of the processing

information for the Bevel, Slanting etc;

1.2.5）LABEL（标识层）仅标注 Rolling Radius（滚圆半径）、Pressing Angle（轧角）、Frame Number（肋位号）、Allowance（余量）等相关文本说明；

The LABEL layer only contains related annotations for Rolling Radius, Pressing Angle, Frame Number, Allowance, etc.;

1.2.6）任何图层中不得含有箭头等尺寸标注；

Any layer shouldn’t include arrows and dimensions;

1.2.7）除 CUT（切割层）、MARK（喷粉层）外，其它层中禁止含有线型实体；

Except CUT and MARK layer, wireframe entity is prohibited.

1.2.8）为保证数据准确，放样文件中只保留上述层名，其它均需清除。

In order to guarantee the data is accurate, the lofting document only retains the above layer names. Other names must be eliminated.

二、线型（Line Type）

2.1）线型设置（Line Type Setting）

2.1.1）所有线型必须为 Continuous（实线）；

All linetype must be Continuous lines;

2.1.2）所有线型必须为 Polyline（多义线），且轮廓线必须保持为 Closed（封闭）

All linetype must be Polyline and the contours must maintain closed;

2.1.3）禁止出现 Spline（样条曲线）、Region（区域）；

The Spline and Region are prohibited;

2.1.4）线段各点之间长度必须大于 5mm。

The line segments must be longer than 5mm.

2.2）线型操作事项（Line Type Operation）

2.2.1）在 AutoCAD 中使用 Boundary（闭合）命令时，禁止使用 Region（区域）选项；

The Region option is prohibited when we use Boundary command in AutoCAD;

2.2.2）在 AutoCAD 中使用 Boundary（闭合）命令会出现错误提示框，此时必须重新检查修正图形后方可继续操作；

When we use the Boundary command in AutoCAD, maybe an error happens. In this case, we should check and modify the geometries and then continue the operations;

2.2.3）在 AutoCAD 中禁止采用 Pedit（编辑多段线）命令进行线型闭合操作方式来生成 Polyline（多义线）；

Closed polyline produced with AutoCAD command Pedit are prohibited;

2.2.4）零件中如存在尖角，应在放样时对其进行圆滑过渡；

Sharp corners should be rounded for lofting;

2.2.5）所有图型必须单独绘制，在使用 AutoCAD 时禁止使用 Block Definition(块定义)，Hatch and Gradient(填充)，Insert（块插入）命令进行操作。

The Block Definition/ Hatch and Gradient /Insert are prohibited

when we use AutoCAD, all drawing must be separate drafting.

三、文本设置（Text Setup）

3.1）文本格式（Text Format）

3.1.1）文本必须保持为 Text（单行文本）;

Every text should maintain one line;

3.1.2）文本必须保持 Height（字高）在 75-100 之间;

Text height must maintain between 75 and 100;

3.1.3）文本 Starting Point（起始点）必须在零件实体内，且 Justify Format（对齐方式）为 Bottom Left（左下角）。

The Starting Point must be within component entity and the Justify Format is Bottom Left.

3.1.4）在 AutoCAD 中 Width Factor（字宽）值必须保持为 1。

The Width Factor value must be 1 in AutoCAD.

3.2）零件名（Part Number）

3.2.1）零件名必须标明分段号，便于材料追踪、MPC 配料、现场施工;

The part number must be marked with block number for material tracing, MPC partition and on-site construction.

3.2.2）零件名必须用“/”做为字段分隔符，且不得含用“\ ： * ？ . “ < > | ”等特殊符号;

The part number must be separated with symbol "/" and it shouldn’t contain distinctive mark such as “\ ：* ？. “ < > |” etc.;

3.2.3）零件名必须保持其唯一性;

The part number must be unique;

3.2.4）为反映零件数量，在零件名后加“(N)”，N 表示件数；

（例：103/P12/001(9)表示 103/P12/001 共 9 件）

In order to reveal component quantity, after part number we add "(N)", N is the number of the parts it is composed of;

(For example: 103/P12/001(9) express 103/P12/001 has 9pcs)

3.2.5）为反映需加工零件信息，在零件名后加“@”，本设置适用于零件过小，无法正常显示或加工信息含有尺寸标识时；

（例：103/P12/001(9)@表示 103/P12/001 共 9 件，需参见套料图所附零件加工小票进行操作）

In order to reveal the processing information of the components, we add "@" after part number which represents the component is too small to show or the processing information includes dimensions;

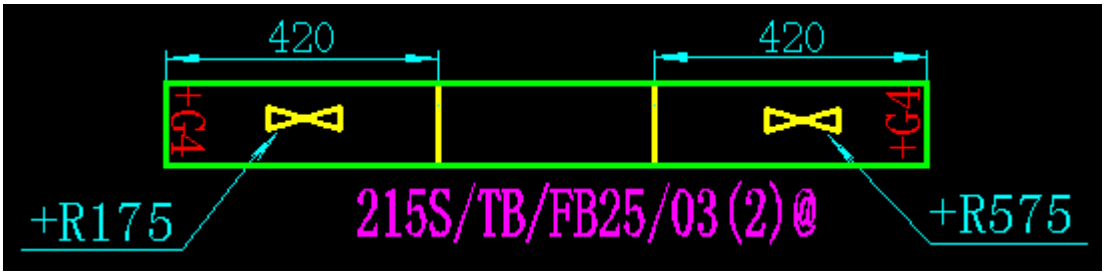
(for example: 103/P12/001(9)@ express 103/P12/001 is 9pcs, the operater need to find the nesting drawing to attach the component’s processing page)

3.2.6）含“@”标识的零件中不得含有其它任何加工信息，利于施工人员区分及根据套料图所附零件加工小票进行操作；

The components marked with “@” shouldn’t include any other processing information for the workers operating according to the attached nesting drawings the component processing page;

套料零件（Nesting Part）

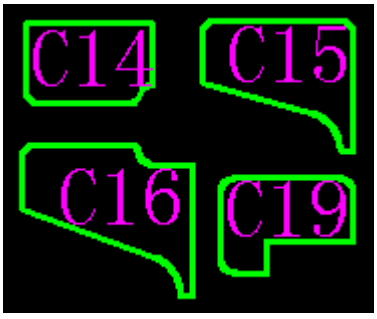
零件加工小票（Components Processing Page）



3.2.7）零件过小，无法标识零件名，可使用 A1,A2,…、B1,B2…等进行代号标注，但必须保持其唯一性，并在 Excel 表中进行说明（如：A1^103/P12/001 表示零件 103/P12/001 在套料图中用 A1 代号），本设置同样适用于加工信息过于复杂，零件空间有限时。

If the components are too small to mark part number, we can use A1, A2... B1, B2... for the coding, but the part number must be unique and explained in Excel table (for example: A1^103/P12/001 expression 103/P12/001 is A1 in nesting drawing). The representation is also suitable for complex processing information which hasn’t enough space to annotate.

零件图（Part Drawing）



零件代码列表(Part Code List)

	F
4	C14^407S/COLL12/06(8)
5	C15^407S/B12/05(12)
6	C16^407S/B12/02(10)
7	C17^407S/COLL12/01(74)
8	C18^407S/COLL12/02(40)

四、加工信息设置（Processing Information Setup）

4.1）常用符号及变量（Commonly Used Symbols and Variables）

4.1.1）所有加工信息标识应尽可能使用符号或英文，避免出现中文字符；

All processing information marking should use symbols or English letters and avoid Chinese characters;

符号 & 变量 Symbol & Variable			
类型 Type	注释 Note	示例 Example	说明 Explain
+	正面符号，必须保留 Obverse symbol, must keep	+G4	正面 G4 坡口 Obverse bevel G4
-	反面符号，必须保留 Inverse symbol, must keep	-G4	反面 G4 坡口 Inverse bevel G4
< >	削斜符号，必须保留 Chamfer symbol, must keep	<+4>15	正面 1:4 削斜至 15mm Obverse 1:4 chamfer to 15mm
( )	现场操作符号 On-site operation symbol	(+G4)	现场进行正面 G4 坡口操作 On-site Obverse bevel G4
A	轧角符号，必须保留 Rolling Angle symbol, must	+90A	正轧 90 度角 Obverse roll angle

	keep		90
D	双面削斜(等厚)符号 Two-sid chamfer symbol(same thickness)	<+4D>15	双面 1:4 削斜至 15mm Two-side chamfer 1:4 to 15mm
R	压弯符号，必须保留 Pressing Round symbol, must keep	+R800	正压弯 R800 Obverse pressing round R800
b	坡口编号值 Bevel coding value	+G4	正面 G4 坡口 Obverse bevel G4
n	角度、半径值 Angle or Radius value	+90A	正轧角 90 度 Obverse roll angle 90
s	削斜比例值 Chamfer scale value	<+4>15	正面 1:4 削斜至 15mm Obverse chamfer 1:4 to 15mm
t	钢板削斜至厚度值 Chamfer to thickness value	<+4>15	正面 1:4 削斜至 15mm Obverse chamfer 1:4 to 15mm

4.1.2）加工信息前必须附加“+/-”标识符，以利于区分零件需加工的正反面位置(此标识符禁止省略)；

Character "+/-" should be added in front of processing information to identify obverse and inverse side of the component (this

identifier must be kept);

4.1.3）加工信息如在“( )”标识内表示此加工信息为现场操作;

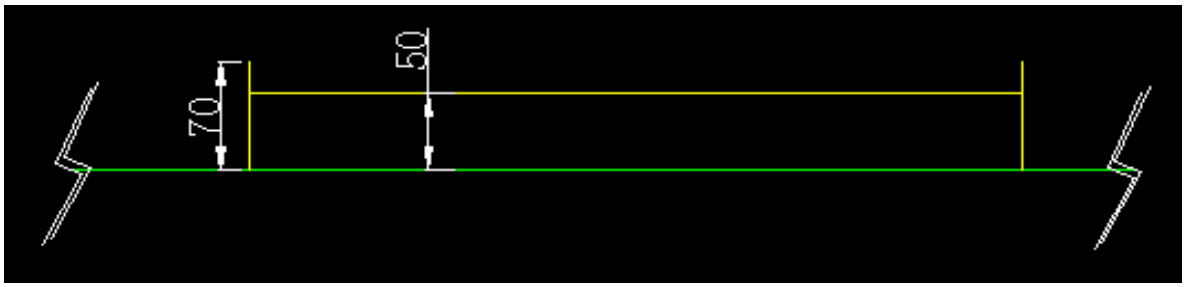
The processing information in "( )" represents on-site operation;

4.1.4）所有坡口、轧弯等加工信息文字必须与所需加工边平行，便于施工人员识别操作;

All processing information texts must be parallel with the processed edge for the operator to distinguish;

4.1.5）特殊加工位置及长度只需绘制加工线进行喷粉，无需尺寸标注(设定喷粉线距板边 50mm，两侧封边保持 70mm 即可)，参见下图:

The special processing position and the length need only processing line to carry on the dusting, it does not need dimensions (we set the marking the distance between marking and the flange is 50mm, the distance between two side edges should maintain 70mm), see the following picture:



4.2）坡口标注（Bevel Label）

4.2.1）坡口具体加工形式，应参见各项目制定的坡口图;

Detailed bevel processing form should refer to bevel drawings of the specific project;

坡 口 Bevel			
标识 Symbol	说明 Notes	示例 Sample	说明 Explanation
+Gb	正面坡口 Obverse bevel value	+G4	正面 G4 坡口 Obverse bevel G4
-Gb	反面坡口 Inverse bevel value	-G4	反面 G4 坡口 Inverse bevel G4
( )	现场操作符号 On-site symbol	(+G4)	现场进行正面 G4 坡口操作 On-site Obverse bevel G4

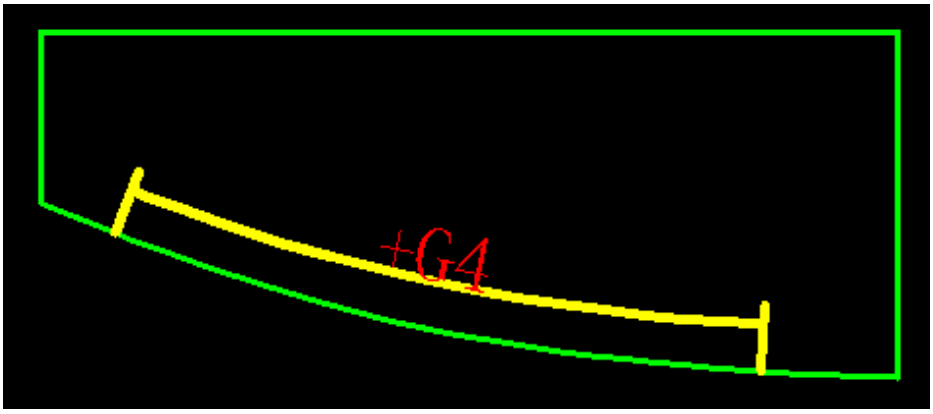
4.2.2)为方便现场人员进行加工，放样时应尽量保证为正坡，避免出现反坡（特殊情况除外）；

In order to facilitate the on-site operation, we should guarantee the bevel is obverse, and avoid inverse bevel (except for special circumstance)；

4.2.3）对于特殊加工位置，需结合 4.1.5 进行绘制喷粉加工线，无需尺寸标注（注意正确设置 MARK 层），参见下图：

Regarding the special processing position, we must unify 4.1.5 to carry on dusting processing line which does not need dimensions

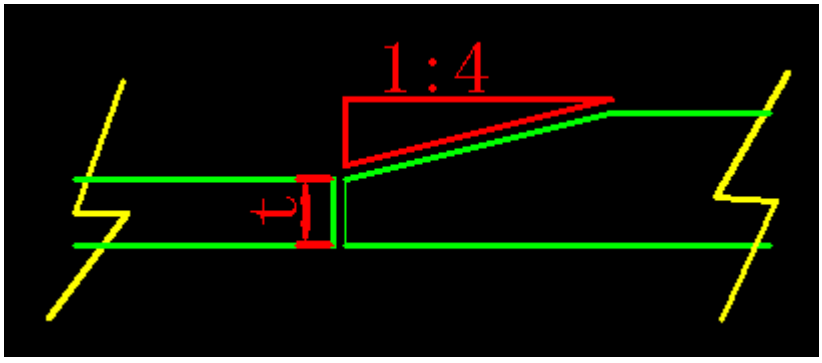
(attention: please set correctly MARK layer correctly), see the following picture:



4.3）削斜标注（Chamfer Label）

4.3.1）现场操作人员根据符号中所标厚度(t)进行比例削斜，参见下图：

On-site operator carry on chamfer according to the marking thickness (t), please see the following picture:



削 斜 Chamfer			
类型 Type	形式 Format	示例 Sample	说明 Description
正面削斜 Obverse chamfer	<+s>t	<+4>15	正面 1:4 削斜至 15mm Obverse chamfer 1:4 to 15mm

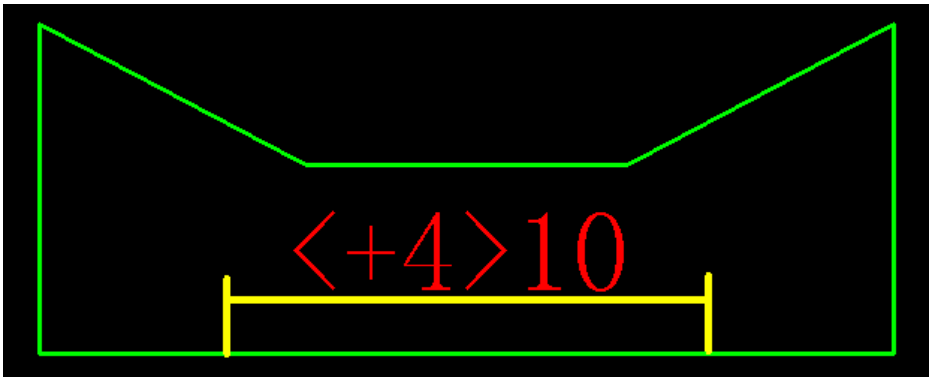
反面削斜 Inverse chamfer	<-s>t	<-4>15	反面 1:4 削斜至 15mm Inverse chamfer 1:4 to 15mm
双面削斜(等厚) Both-side chamfer (equal thickness)	<+sD>t	<+4D>15	双面 1:4 削斜至 15mm Both-side chamfer 1:4 to 15mm
双面削斜(不等厚) Both-side chamfer (unequal thickness)	双面削斜(不等厚)，根据加工图进行具体操作 The both-side chamfer (unequal thickness),according to detail processing drawing processing drawing		
现场操作 On-site operation	( )	(<+4>15)	现场进行正面 1:4 削斜至 15mm 操作 On-site obverse chamfer 1:4 to 15mm

4.3.2)为方便现场人员进行加工，放样时应尽量保证为正削斜，避免出现反削斜（特殊情况除外）；

In order to facilitate the on-site operation, we should guarantee chamfer is obverse, and avoid inverse chamfer (except for special circumstance)；

4.3.3）对于特殊加工位置，需结合 4.1.5 进行绘制喷粉加工线，无需尺寸标注（注意正确设置 MARK 层），参见下图：

Regarding the special processing position, we must unify 4.1.5 to carry on dusting processing line which does not need dimensions (attention: please set correctly MARK layer correctly), see the following picture:



4.4）坡口 & 削斜组合标注（Bevel & Chamfer Combination Label）

4.4.1）各项目建造工艺不同，要根据具体情况对待；

Every project has its own technics, so we must treat them according to their own conditions;

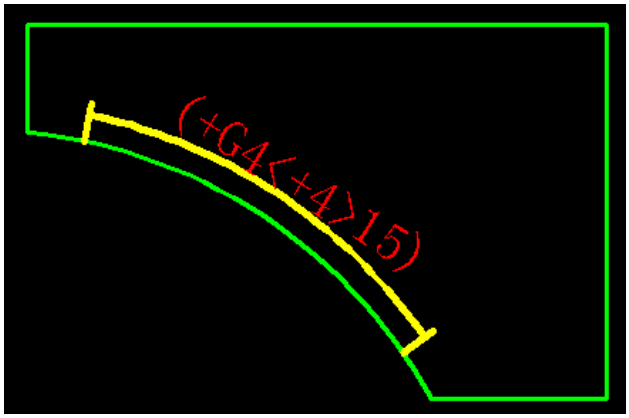
坡口 & 削斜 Bevel & Chamfer			
类型 Type	形式 Form	示例 Example	说明 Explain
先削斜 后坡口 First Chamfer Then Bevel	<+s>t+Gb	<+4>15+G4	先正面 1:4 削斜至 15mm,后正面 G4 坡口 First 1:4 chamfer to 15mm obverse, then G4 bevel in obverse.

先削斜 后坡口 First Chamfer Then Bevel	<+s>t-Gb	<+4>15-G4	先正面 1:4 削斜至 15mm,后反面 G4 坡口 First 1:4 chamfer to 15mm obverse, then G4 bevel inverse.
	<+sD>t+Gb	<+4D>15+G4	先双面 1:4 削斜至 15mm,后正面 G4 坡口 First 1:4 chamfer to 15mm both-side, then G4 bevel obverse.
	<+sD>t-Gb	<+4D>15-G4	先双面 1:4 削斜至 15mm,后反面 G4 坡口 First 1:4 chamfer to 15mm both-side, then G4 bevel inverse.
	双面削斜(不等厚)，根据加工图进行具体操作 The both-side chamfer (unequal thickness),according to detail processing drawing		
先坡口 后削斜 First Bevel Then Chamfer	+Gb<+s>t	+G4<+4>15	先正面 G4 坡口,后正面 1:4 削斜至 15mm G4 bevel obverse, then chamfer 1:4 to 15mm obverse

先坡口 后削斜 First Bevel Then Chamfer	-Gb<+s>t	-G4<+4>15	先反面 G4 坡口,后正面 1:4 削斜至 15mm G4 bevel inverse, then chamfer 1:4 to 15mm obverse.
	+Gb<+sD>t	+G4<+4D>15	先正面 G4 坡口,后双面 1:4 削斜至 15mm G4 bevel obverse, then chamfer 1:4 to 15mm both-side.
	-Gb<+sD>t	-G4<+4D>15	先反面 G4 坡口,后双面 1:4 削斜至 15mm G4 bevel inverse, then chamfer 1:4 to 15mm both-side.
	双面削斜(不等厚)，根据加工图进行具体操作 The both-side chamfer (unequal thickness),according to detail processing drawing		
现场操作 On-site operation	( )	(<+4>15)	现场进行正面 1:4 削斜至 15mm 操作 On-site chamfer 1:4 to 15mm obverse.

4.4.2）对于特殊加工位置，需结合 4.1.5 进行绘制喷粉加工线，无需尺寸标注（注意正确设置 MARK 层），参见下图：

Regarding the special processing position, we must unify 4.1.5 to carry on dusting processing line which does not need dimensions (attention: please set correctly MARK layer correctly), see the following picture:



4.5）轧角标注（Rolling Angle Label）

轧 角 Rolling Angle			
类型 Type	形式 Form	示例 Example	说明 Explain
正轧角 Obverse Rolling Angle	+nA	+90A	正轧 90 度角 Rolling Angle is obverse 90°
反轧角 Reverse Rolling Angle	-nA	-90A	反轧 90 度角 Rolling Angle is reverse 90°

4.5.1）为方便现场人员进行加工，放样时应尽量保证为正轧角，避免出现反轧角（槽型舱壁等特殊情况除外）；

In order to facilitate the on-site operation, we should guarantee rolling angle is obverse and avoid inverse rolling angle (except for special circumstance such as corrugated bulkheads);

4.5.2）轧角符号标识采用喷粉划线，标识如下图所示：

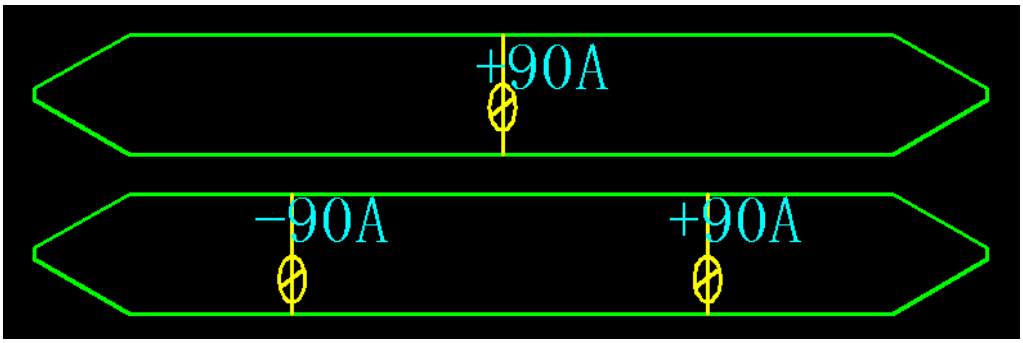
Rolling angle marking must be dusted to draw a line as the following:

4.5.3）轧角符号必须单独绘制，在使用 AutoCAD 时禁止使用 Block Definition(块定义)，Hatch and Gradient(填充)，Insert（块插入）命令进行操作；

The Rolling angle symbol must be separate drafting, the Block Definition/ Hatch and Gradient/Insert are prohibited when we use AutoCAD;

4.5.4）放样时只在需加工位置绘制轧角符号及填写轧制角度值，无需尺寸标注（注意正确设置 MARK 层）具体标注形式如下图所示。

While lofting, we only need to add rolling angle symbol and rolling angle value in the process position, we needn’t dimensions (Attention: set MARK layer correctly), detailed format as the following picture.



4.6）压弯标注（Pressing Round Label）

压 弯 Pressing Round			
类型 Type	形式 Form	示例 Example	说明 Explain
正压 Positive Pressure	+Rn	+R800	正压 R800 Positive pressure R800
反压 Counter Pressure	-Rn	-R800	反压 R800 Counter pressure R800

4.6.1）为方便现场人员进行加工，放样时应保证为正压，尽量避免出现反压（特殊情况除外）；

In order to facilitate on-site operation, we should do our best to guarantee positive pressure and avoid counter pressure (peculiar circumstance to be an exception)；

4.6.2）压弯线、压弯符号采用喷粉划线，标识如下图所示：

The pressing lines and pressing symbols use dusting to draw as the following:

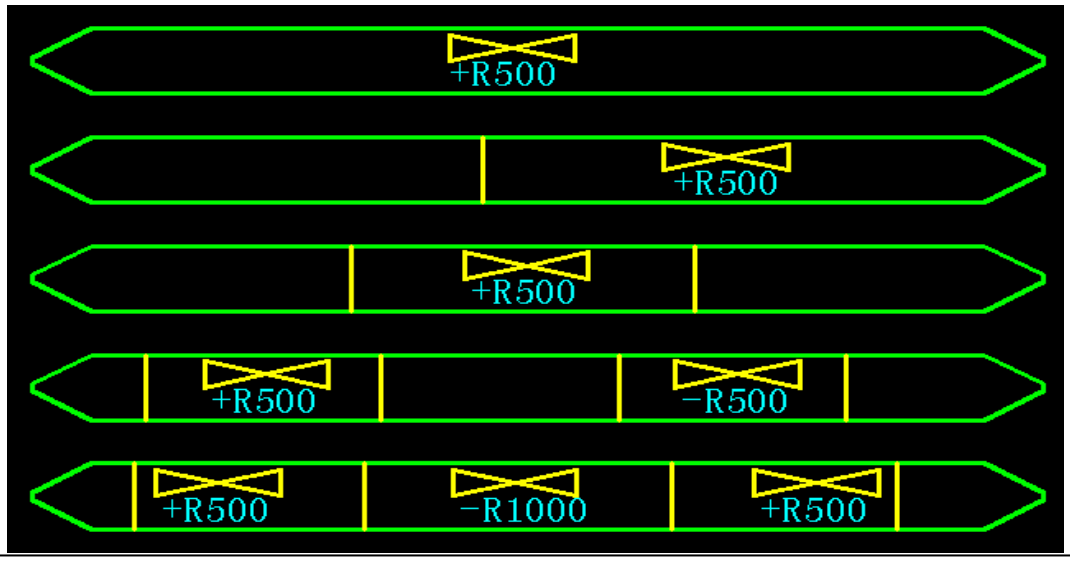
压弯线 （Pressing Line）  压弯符号（Pressing Symbol） 

4.6.3) 压弯符号必须单独绘制，在使用 AutoCAD 时禁止使用 Block Definition(块定义)，Hatch and Gradient(填充)，Insert（块插入）命令进行操作；

The pressing symbols must be separate drafting, the Block Definition/ Hatch and Gradient/Insert are prohibited when we use AutoCAD;

4.6.4）放样时只在需加工位置绘制压弯符号及填写压弯半径值，并绘制压弯线指明压弯范围，无需尺寸标注（注意正确设置 MARK 层）具体标注形式如下图所示：

During lofting we only need draw pressing lines, pressing symbols and radius value in the process position, we don’t need dimensions (Attention: set MARK layer correctly). Detailed format as the following picture:



4.6.5）无压弯线，只有压弯符号时表示此零件按压弯符号方向进行加工；

If the annotation contains only pressing symbol and without pressing line, it means the component should be pressed according to the direction and round radius value;

4.6.6）只有一根压弯线和压弯符号时表示此零件加工位置是压弯符号在压弯线一侧区域；

If the annotation contains only a pressing line and symbol, it means the processing region is on the side of pressing symbol.

4.6.7）有两根压弯线且加工符号在其间时表示此零件加工位置在两根压弯线段之间。

Two pressing lines and a pressing symbol between them express the process position of the component is between the two pressing lines.

4.7）样板线标注（Former Line Label）

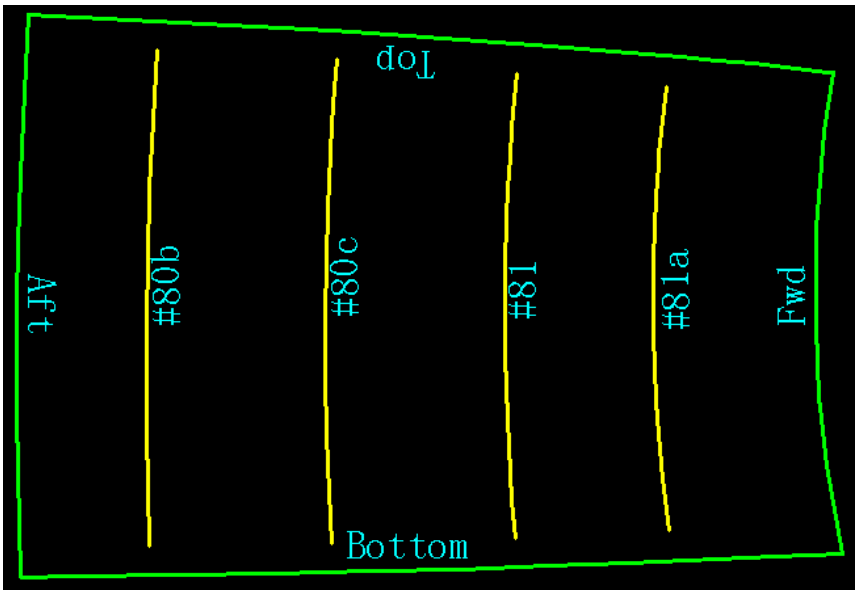
样 板 Former	
标注 Label	说明 Explain
TOP	上
BTM	下
FWD	首
AFT	尾
Portside	左舷
Starboard	右舷

4.7.1）样板线采用喷粉划线；

The former line should be dusted;

4.7.2）放样时只需在加工样板所在位置绘制样板线，并标注相应文本信息（注意正确设置 MARK 层），如下图所示：

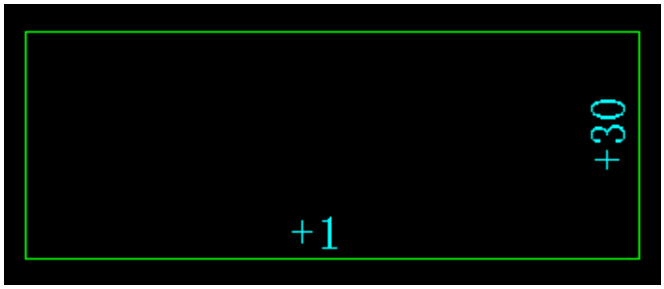
During lofting we only need to draw the former line in the process position, we do not need to add dimensions (Attention: set MARK layer correctly) the detailed sign as following:



4.8）余量标注（Surplus Label）

4.8.1）焊接收缩量、合拢余量均采用“+N”进行标注，N 为实际余量数值，（如+30 表示已加 30mm 余量）。

Welding contraction and assemblage surplus is annotated with "+N". N is the actual surplus value (For example, +30 means a surplus of 30mm).



五、零件设置（Part Setup）

5.1）零件尺寸（Part Dimension）

5.1.1）所有零件长宽（含收缩量、余量）必须事前考虑，保证零件与套料板幅长、宽四边上都预留出足够的切割量，以保证零件实际切割精度，具体参数如下表所示：

All the lengths and breadths of the component (including contraction and surplus) must be considered for keeping enough surplus on all the edges to guarantee actual cutting precision. Detailed parameters as the following table:

切 割 量 Cut Quantity	
板厚 Thickness	预 留 Surplus
<30mm	10mm
≧30mm and < 50mm	15mm
≧50mm	20mm

5.1.2）在下发 MEO 时，应考虑此预留切割量，定购板材，并根据 P.D.（采购）反馈信息及时做好调整；

For sending MEO, we should consider the cutting surplus to order plates and adjust in time according to the feedback from P.D. (Purchasing Department);

5.1.3）在 CATIA 中使用 SDD 模块时应事先参照此预留切割量进行相应板缝划分。

In SDD phase with CATIA solution, we should plan the seam lines according to the cutting surplus beforehand.

5.2）零件图形（Part Drawing）

5.2.1）零件必须保持 1:1 图形比例；

Drawing scale must be 1:1;

5.2.2）零件必须为封闭图形；

The part profile must be closed;

5.2.3）零件轮廓线中禁止含有重叠线段；

Overlapped line segments are prohibited in part profile;

5.2.4）零件轮廓与轮廓之间必须保持一定间隙；

There should be gaps between part profiles;

5.2.5）零件应按长度方向保持水平放置；

Parts should maintain parallel along length direction;

5.2.6）对称零件必须分别绘制，禁止使用同一零件；

Symmetrical parts must be separately drawn. They shouldn’t use the same drawing;

5.2.7）零件相同，名称不同，必须分别绘制；

Parts with the same profile but different names should have different drawings.

5.2.8）所有零件名称与零件必须为一一对应，保持其唯一性；

All the part names must be one-to-one with the parts to keep its uniqueness;

5.2.8）不同板幅、板厚、板级的零件应分类汇总，并标注板材可调用数量及相关说明。

Different plate size, thickness, grade of material should be classified and compiled with its available quantity and related description.

以上规范在使用 AutoCAD & CATIA 进行零件放样时必须严格遵守，且在 AutoCAD 中应使用 Purge（清除）及相关命令进行文件清理压缩，保持 AutoCAD 文件在传送至套料组时清洁。

The above standard must be strictly observed while lofting components with AutoCAD & CATIA, and we should use “Purge” command and other related commands in AutoCAD to clean and compress the data, in order to keep the AutoCAD file clean for transmission to Nesting Team.

---END---