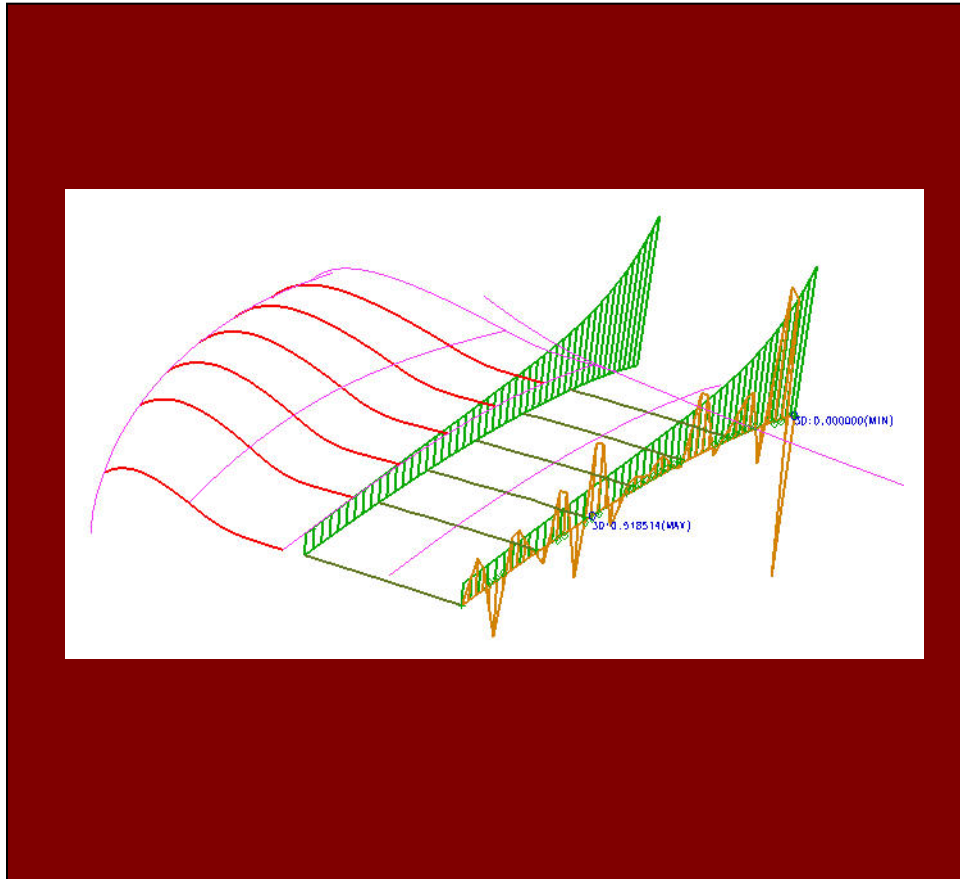


# **NX 5 CAD DESIGN**



## **ADVANCE SURFACING TECHNIQUES**

### **NX5**

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**A U R O R A**  
**CAD TRAINING AND DEVELOPMENT**  
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# Advance Surfacing Techniques

## Introduction

This manual is intended to illustrate techniques used in creating Quality Aesthetic Surfaces.

The methods covered are so the surfer will have a good understanding of creating Advanced Surfaces. No manual can nor is intended to replace design experience in the creation of Advanced Surfaces. The methods described in creating Advanced Surfaces are not limited to those covered in this manual.

This Advanced Surfacing course is to familiarize the surfer with tools used to acquire aesthetic results for both Interior and Exterior Surfaces.

## Chapter 1

### Spline Creation

It is important to understand that the quality of the surface created depends on the quality of the curves used to generate the surface.

Most surfaces are created using Splines or what is considered Advanced Curves. Each of the several Spline creation methods available has its advantages and disadvantages. The other Advanced Curves used are more limited in their Creation and Edit options but also have advantages as well as disadvantages.

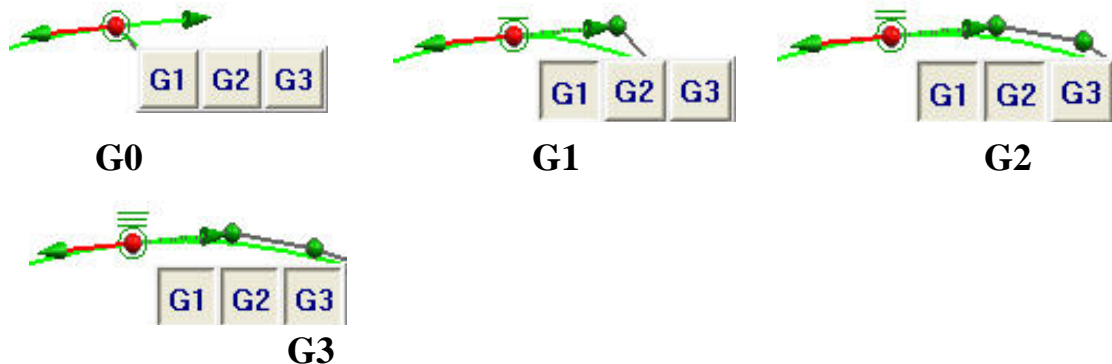
One of the most important Advance Curve creation options is Splines. Splines are the only curve type that can be created three dimensionally and there are several creation and edit options that provide tremendous flexibility in their shape. Having a complete understanding of Spline creation and editing is critical to many areas of design, especially Surface creation and editing.

### Associative Splines

Associative Splines are an alternative option to regular Spline creation. They have additional edit options available and more control in their creation and edit continuity. Studio Spline is used to create associative splines.

Associative Splines have three Constraint options at the time of creation and edit that basic Splines do not have.

### Continuity symbols



Associative Splines can be created either Through Points or By Poles.

## Chapter 2

### Bridge Curve

Another excellent Curve type for creating Advanced Surfaces is a Bridge Curve.

Bridge Curve creates a curve that fills the gap between two curves at a specified point along those curves. It is not restricted to only end points. Select the Bridge Curve icon from the Curve Toolbar to activate the Bridge dialog.

Bridge curves can either be Tangent or Curvature.

Continuity Methods: Tangent, and Curvature.

Tangent—Creates a 3-degree, 4 pole curve that is tangent to the Parent Curves.

Curvature—Creates a 5-degree, 6 pole curve that is tangent and curvature continuous to the selected curves.

## Chapter 3

### Framing for Surface Development

#### Creating a Fit Spline

The Primary purpose for Framing is to create curves that will simplify a scanned surface or scanned curves.

Simplifying the Surface defining curves will simplify the surface and make editing easier.

Once a Spline has been simplified the next step would be to modify the New Curve to eliminate any Reversal of Curvature and match the original scanned data to within a tolerance range.

## **Chapter 4**

### **Proportional Curves**

Proportional Curves are a group of curves with similar curvature characteristics and the distance between each of the curves' poles is proportional to the succeeding curve. Keeping similar pole placement helps maintain continuity and prevent unwanted changes of curvature. This is a good practice if the curves are going to be used to build a Sheet Body. Sheet Bodies built from proportional curves display a gradual color change when analyzed by Face Analysis that is proportional with the change in the rate of curvature within that sheet. A curvature graph of these curves will demonstrate the proportional change in the rate of curvature.

This method of curve creation is used when the curvature characteristics needs to be duplicated. This also will result in a Sheet Body creation that minimizes the chance of having unwanted flat areas or irregularities in curvature.

## Chapter 5

### Shape by Template

Shape by Template allows modifying an existing spline by inheriting the attributes of a Template Spline.

Using the 7-degree, Single Segment spline as the Template curve will change the attributes of the 3-degree, Multiple Segment spline to those of the Template curve. The modified Spline will not duplicate the shape of the Template Curve but will modify its shape because.

Once the Template Spline is selected a slider bar can be used to change the shape of the edited spline.

## Chapter 6

### Balanced Curves

A Balanced Curve is one that can be Mirrored through a Centerline Plane without producing Flaws in Curvature. These Flaws can be Creases or Ridges. The desired condition after Mirroring would produce curves that are Tangent or Curvature Continuous. Flaws can be easily detected by displaying a Curvature Comb.

## Chapter 7

### Tangency and Curvature Constraints

Tangency and Curvature Constraints are used to create a smooth Sheet Body flow from one shape into another at adjacent edges for producing the highest quality surface.

Identify the various Constraints

The Curve Constraints dealt with are G1, G2, and G3.

- G1 is a Tangent Continuity applied to corners. It is a condition of adjacent curves that are  $180^\circ$  to each other when measured.
- G2 is a condition where adjacent curves are Tangent, they have the same Curvature at the point of measurement but do not have the same Rate of Curvature or Acceleration
- G3 Continuity is where the adjoining curves are adjacent, have the same Curvature, and have the same Rate of Curvature.

Also included in Advance Surfacing are Projected Curves, Combined Projection, and Intersection Curve.

**Project** is used to Project Curves or Points onto Sheet Bodies, Faces, Planes, and Datum Planes.

**Combine Projection** allows you to create a curve at the intersection of two existing curves. The curves being Projected must have an intersection.

**Intersection Curve** allows you to create curves at the Intersections of other objects.

Chapter Eight

**NX 5**  
**Advanced Surfacing Techniques Summary**

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Enlarge

Enlarge allows the modification of an untrimmed Sheet. The Sheet can either be increased Linearly or Naturally.