

24/7 on 6 Continents: 1 Ford, 1 Goal, 1 Team = 1 CAD Standard

Jeanne Aarhus – Aarhus Associates, LLC

Kevin Clegg – Ford Motor Company

Paula Wiebelhaus – Ford Motor Company



Class Summary

Ford Motor Company presents its experiences in attaining one CAD standard available 24/7 on six continents. Learn the ups and downs of this process. We will talk about which products and solutions were successful and which ones "hit the road." Is it really possible to implement CAD standards on this large a scale? Yes, but there were a few "speed bumps" and "potholes" along the way (and no, you can't "bail out"). Attend this class to hear how you too can drive your CAD standards into the fast lane and put them into overdrive.



Learning Objectives

At the end of this class, you will be able to:

- Avoid CAD collisions and slow-moving users
- Implement standards that can travel both inside and outside the company
- Shift the process to increase your speed and maneuver around what slows you down
- Accelerate around users and managers who try to put the brakes on these objectives

“If I had asked my customers what they wanted they would have said a faster horse”

Henry Ford



Presenters Summary



Jeanne Aarhus

Jeanne is known for keeping her training sessions fast moving and fun. She is a nationally known speaker and expert in CAD, and presents seminars and workshops on CAD productivity for managers and users in both corporate and college settings. She has over 25 years experience involving production drafting, user support, standards coordination, programming, and training in various CAD applications. Jeanne is an independent consultant offering training and implementation services and is certified in several Autodesk® and Bentley® products. She has been a popular speaker at AU for several years; and recently won a coveted “Top Ten Speaker” award at AU.

jeanne@aarhusassociates.com



Presenters Summary



Kevin Clegg

Kevin is well known at Autodesk University as the #1 promoter of Ford Motor Company; while coordinating the licensing, training and CAD standards of a global user community he also manages the day to day business of delivering powertrains for vehicle platforms; currently the newest version of the 6-speed transmission for the Ford F-150 truck lines. His understanding of CAD requirements comes first hand having been involved with Ford CAD design for 22 years. Prior to Ford, Kevin worked for the Architecture and Plant Engineering department for the University of Michigan renovating buildings. Kevin attended the University of Michigan for undergraduate studies in design and fine arts and graduate studies in architecture.



kclegg@ford.com



Presenters Summary



Paula Wiebelhaus

Paula is a member of the Ford Motor Company Team, and has been involved with Ford Corporate Standards and Specifications for CAD and drafting for 10 years. Prior to her affiliation with Ford, she assisted other plant engineering automotive groups and suppliers with standards, libraries, and drafting. She is a graduate of Western Michigan University with a BS in engineering graphics, and has over 26 years of experience using AutoCAD® starting with release 2.5.

jwgraphicsinc@comcast.net



Is this YOU?



"Don't find fault, find a remedy; anybody can complain"

Henry Ford



...or are YOU more like this?



"Most people spend more time and energy going around problems than in trying to solve them."

Henry Ford



Why have Standards?

- The reasons are many and varied and not all users want to follow a standard or know why they personally will benefit.
- When you look at the efficiencies of production lines one major feature stands out, common methods based on standards. This is evident from when Henry Ford first created the production line to today's complex and highly automated manufacturing systems. Every process requires a standard approach.
- As the process expands so does the need for standards. If you make one widget and sell it you are an inventor or craftsman. If you make 100 you are a businessman. If you make 1,000,000 you are successful!
- Standards are relevant to the process you are doing today for the deliverable that you have defined for today.
- Standards change! And think future, measured in “years”, not “days”

“Vision without execution is just hallucination”

Henry Ford



Do We Currently Have Standards?



Let me count the ways!

- We have as many standards as we do model and make of cars!
 - Ford North American CAD Specifications
- We have as many countries as we do states!
 - North American
 - Europe
 - Asia Pacific
- Technology drives many changes both in standards and practices
 - BIM
 - 3D derived from point clouds



CAD Standards Include...and Depend on...

- Standards Documentation (00 22 23)
- Standard Resources
- Ford Autodesk Community
- Sharepoint Site (internal to Ford employees)
- IT Service Request Center
- Autodesk Platinum Support
- Standards Training

“Failure is simply the opportunity to begin again, this time more intelligently”

Henry Ford



CAD Standards Objectives

- **Commonization**
 - Communication
 - Education
 - Suppliers
 - Globalization
- **Efficiency**
 - Documentation
 - Standardization
 - Automation
- **Organization**
 - Resources
 - Best Practices
 - Enforcement

Think “CEO”



Been There..Done That!



Commonization

Implement Standards that can travel “inside” and “outside” the company!



Commonization: Communication

Delivery Methods:

- CAD Standards Portal (Single-Click Ford CAD Store)
- Community Site

Recipients:

- Find your customers
- Listen to your customers
- Sell to your customers

What delivery method do you use to pump gas into your car?



Commonization: Communication

Once you FIND your Customers – DEFINE Them

- Back Seat users (micro-managers)
- Slow Moving users
- Information Hoarders
- Diplomats

Once you DEFINE them – COMMUNICATE with them

“If there is any one secret of success, it lies in the ability to get the other person's point of view and see things from that person's angle as well as from your own”

Henry Ford



Commonization: Communication

Hurdles to Overcome:

- Multiple Time Zones and Languages
- Wagons around the plant
- Fighting for job security
- Avoid CAD Collisions

“When everything seems to be going against you, remember that the airplane takes off against the wind, not with it”

Henry Ford



Commonization: Communication

Winning Over Your Customers:

Who did we win over within Ford?
Management, IT, and Users

Accomplishments:

90% in agreement
10% still poles apart

We want to avoid any of our customers “bailing-out” and returning back to their old individual standards

“Success is 99% failure”

Henry Ford



Commonization: Education

The KEYs to success:

- Update the DRIVERS with the AUTOMOBILE
- Allow for multiple ROADS and DETOURS to Learning
- Offer multiple MAKE and MODELS to Learning

Advertise!

“Anyone who stops learning is old, whether at twenty or eighty. Anyone who keeps learning stays young. The greatest thing in life is to keep your mind young.”

Henry Ford



Commonization: Education

Training users in today's economy

- PAL program
- Project Assisted Learning
- WILL program
 - Web Instructor-led Learning
- Webcasts
 - Online pre-recorded Learning
 - Online Live Learning
- Classroom Learning
 - Instructor-led Learning



Trouble Learning NEW Tools?



"I'VE SEEN IT BEFORE. HE'S ABOUT TO AUTOSNAP"

"Thinking is the hardest work there is, which is probably the reason why so few engage in it"

Henry Ford



Commonization: Suppliers

- Develop and Implement Standards Checking software (CADconform)
- Develop Supplier Community Notes
- Simplify Supplier access to CAD Standards resources
- Develop Supplier Learning opportunities
- Develop Supplier support and interaction

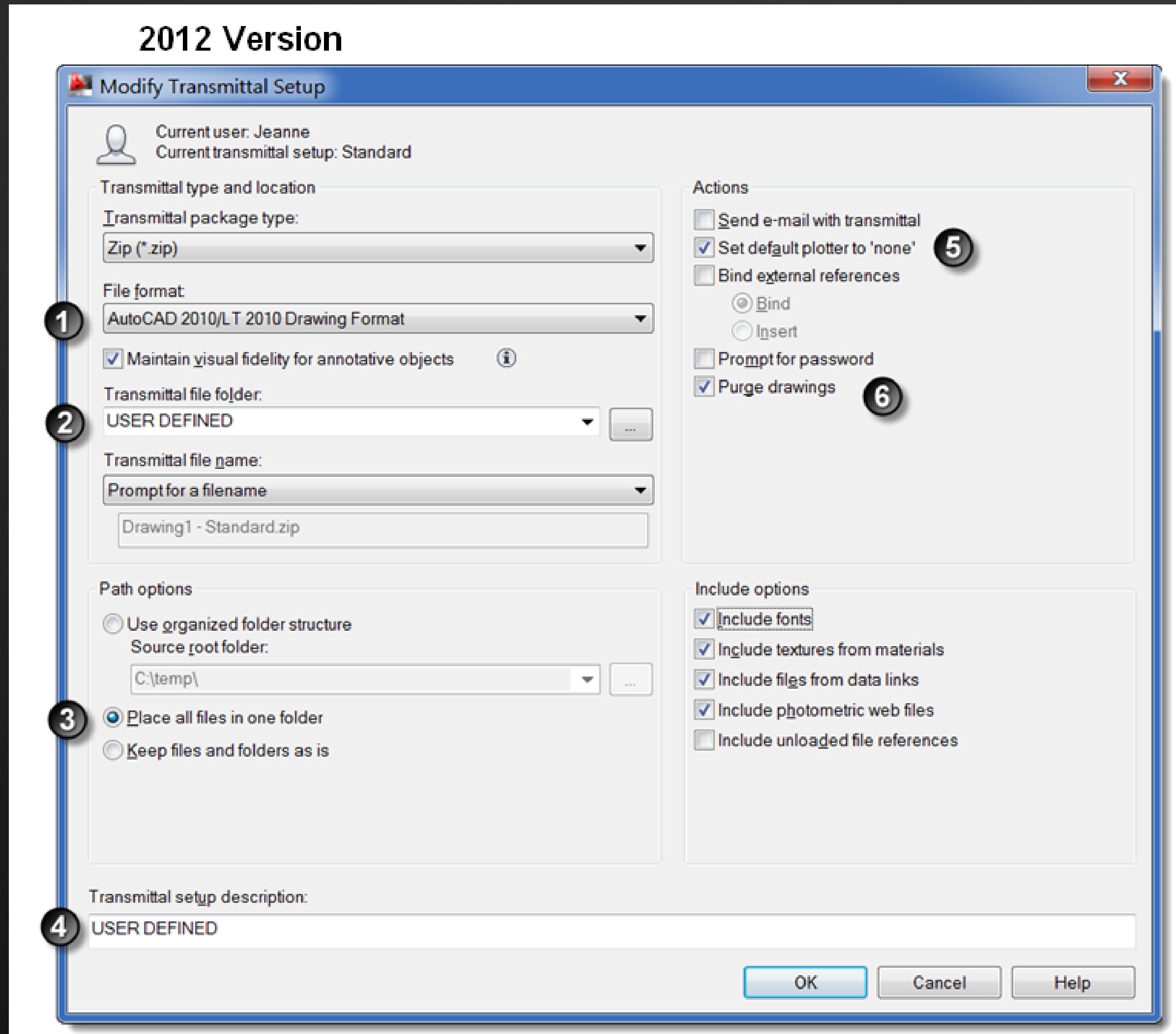
“Coming together is a beginning; keeping together is progress; working together is success”

Henry Ford



Commonization: Suppliers

- Deliverable Standards and Requirements



Commonization: Globalization



What is Globalization?

The Americas

- 28 manufacturing facilities in US
- 17 manufacturing facilities in Canada, Mexico, Brazil, Argentina and Venezuela
- Design and Engineering Offices
- Real Estate/Commercial Properties

Europe

- 32 manufacturing facilities in England, France, Germany, Portugal, Spain, Turkey, Russia, and S. Africa
- Design and Engineering Offices
- Real Estate/Commercial Properties

Asia/Pacific

- 19 manufacturing facilities in Australia, Thailand, Vietnam, Malaysia , Taiwan, China and India
- Design and Engineering Offices
- Real Estate/Commercial Properties



Commonization: Globalization



Where are we?

- Achieved 80% global compliance
- Working to align the remaining 20%
- We may have to “AGREE to DISAGREE”

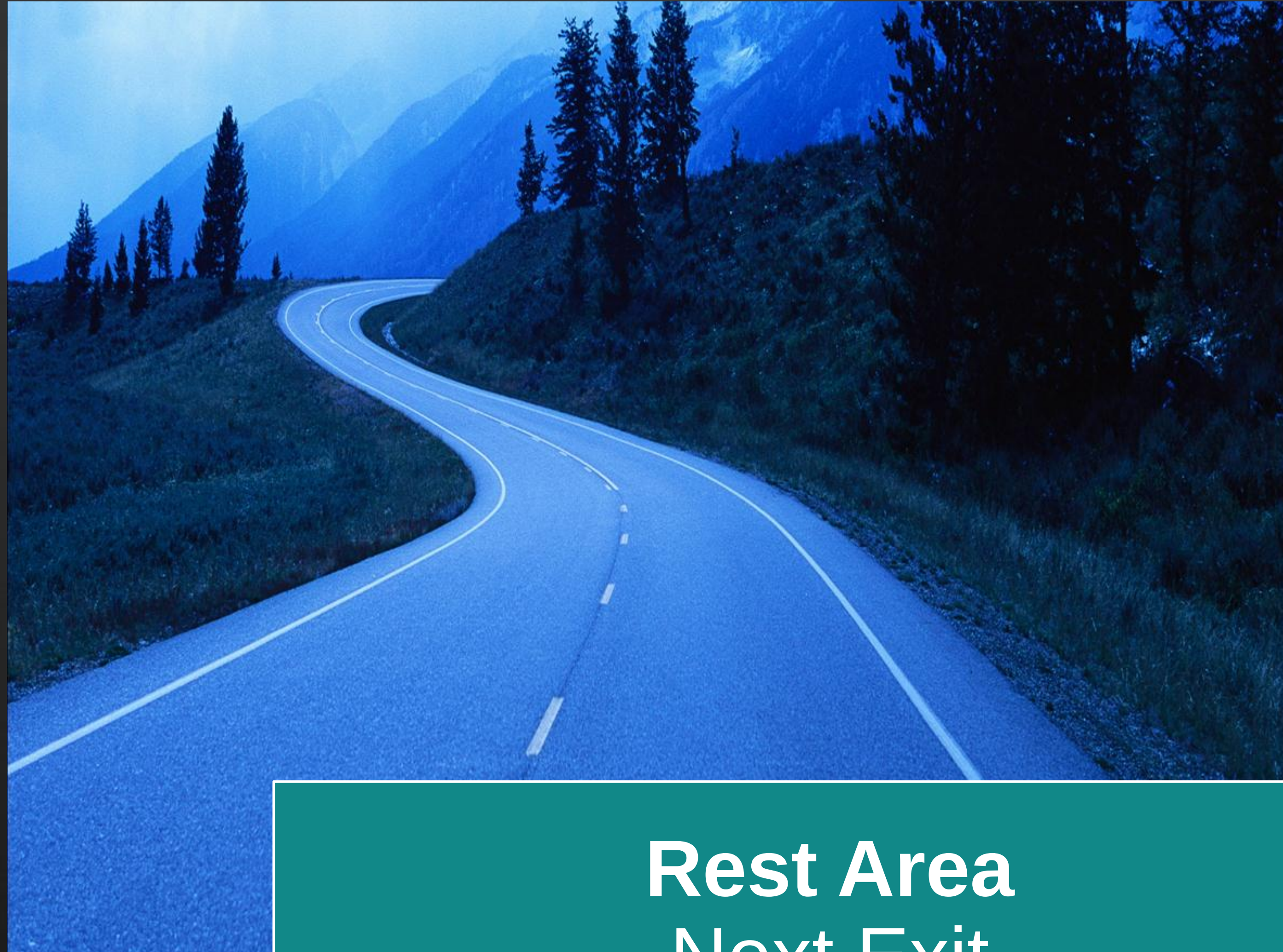
How Long did it take?

4 years into the process for North America with our sights set on globalization

“There are no big problems, there are just a lot of little problems”

Henry Ford





**Rest Area
Next Exit**



Everyone STAND UP!!!!



SIT DOWN if your car has
less than 100,000 miles

SIT DOWN if your car has
less than 125,000 miles

SIT DOWN if your car has
less than 150,000 miles



You WIN!!!!!!



Efficiency

Shift the process to increase your speed and maneuver around what slows you down.



Road Map

- Prepare a Road Map so everyone knows which route to take.
- Perform thorough testing prior to launch of any new standard.
- Engage the engines of ALL users; both internal and external.
- Be willing to modify the engine design after receiving feedback.
- Allow for detours

Without a Road Map

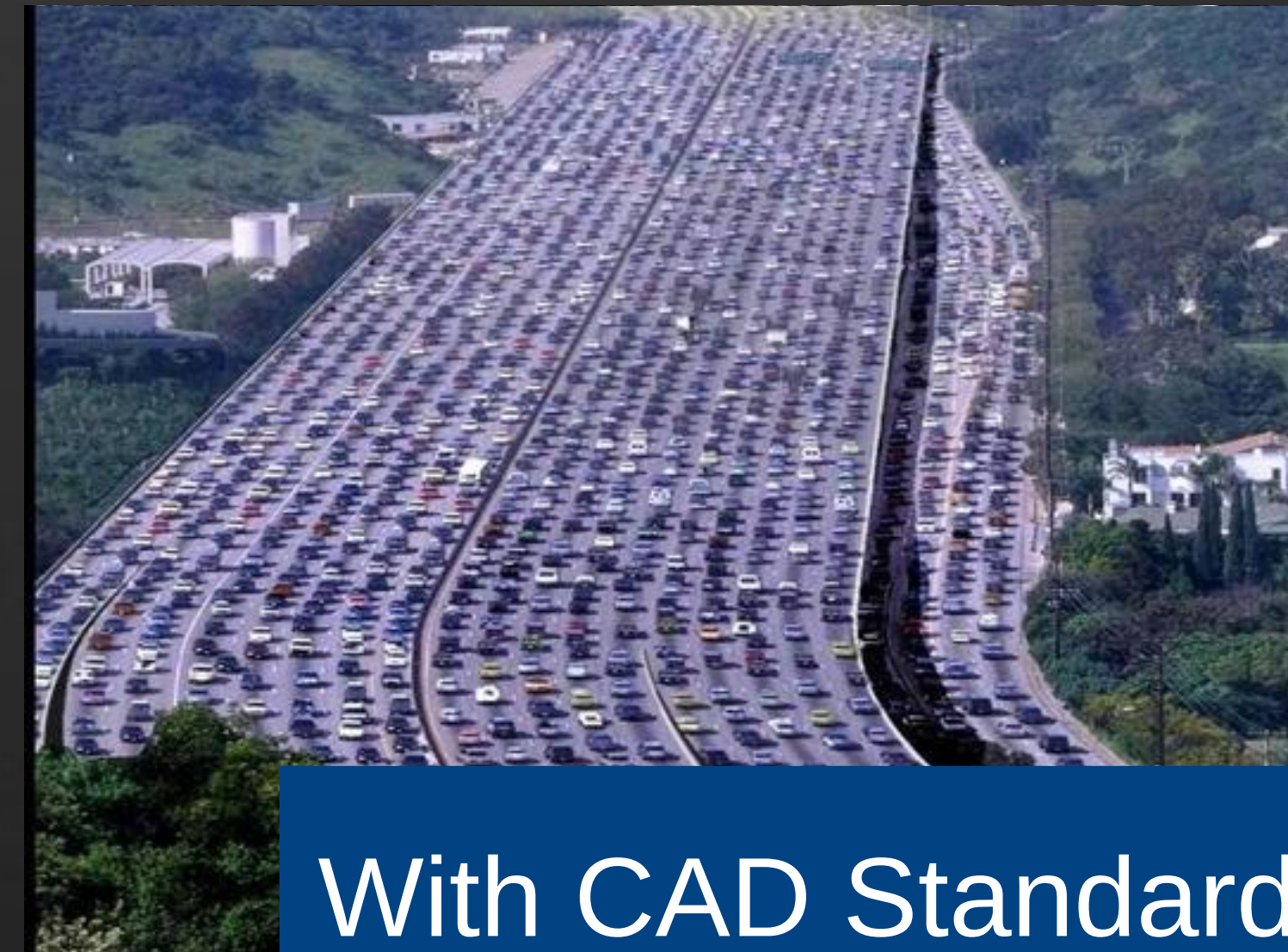


Efficiency: Rules of the Road

We All Travel More Efficiently



Without CAD
Standards



With CAD Standards

...consider how these CEO qualities can help you
in your day-to-day travels...



Efficiency: Documentation



Section 00210

CAD Specifications

1 About this Document

1.1 Introduction

Specification: *The term specification, standard, CAD Standard, or CAD Specification shall refer to this document and its requirements.*

CAD: *Computer-Aided Drafting.*

The CAD Specification 00210 is a revision of the CAD/CAFM Standards document 00210, located in <http://www.vo.ford.com/specs/> North American Construction Specifications Section, Construction Specifications. The document was reviewed by Ford Motor Company North America representatives from Information Technologies, Powertrain Operations, Vehicle Operations and Ford Land. The CAD Specification applies to all facility projects and programs starting with the release of the specification. The CAD Specifications shall be in



Efficiency: Documentation

Attachments (Appendices)

Section 00210



CAD Specifications

Section 00210



CAD Specifications

Attachment B: Standard Layers

G-General Layers

Name	Description
0	AutoCAD Block (NOT USE)
Defpoints	AutoCAD ONLY
0-ANNO-NPLT	NON-PLOTTING Annotation
0-ANNO-SCRN	SCREENED items
0-VPRT	Viewports - WIP
0-XREF	Xrefs:
0-XREF-BLDG	Xrefs: Building
0-XREF-FURN	Xrefs: Furniture
0-XREF-LIST	Xrefs: Attached
G-ANNO-DIMS	Annotation: Geometric
G-ANNO-EVAC	Annotation: Evacuation
G-ANNO-IDEN-FCAD	Balloons and Leaders

Section 00210



CAD Specifications

21 Attachments

Attachment A: File Name Identifiers

North America

Plant ID's

Describes the LOCATION of the drawing contents.

Plant ID's	
Vehicle Operations - NA	
ID	Plant Name
AAI	Flatrock-Auto Alliance - Assembly
AAS	Flatrock-Auto Alliance - Stamping
BSP	Buffalo Stamping
CHI	Chicago Assembly

Standard Ford Tool Customizations

Items are available to simplify and automate multiple tools and FCS issues. Use the (AutoCAD_Classic or Ford_ACAD_Ribbon) to access these items through various methods.



Historic versions of the FCS installations. AutoCAD_Ribbon workspace. Many of these are "hidden" and not easily accessible and are



Efficiency: Documentation

Explanations/Definitions

Object Enabler: An object enabler is a tool that provides specific viewing and standard editing access to a custom object in the host applications when the application that created the custom object is not present.

Smart Objects: Are objects in a drawing that

3.3 Object Enablers

All AutoCAD and FactoryCAD 3D objects can be displayed and viewed with regular AutoCAD provided the applicable Object Enabler is installed. Object Enablers are free and can be readily installed to facilitate viewing of the Smart Objects. Contact your IT department if you cannot view the smart objects produced by FactoryCAD, Architectural Desktop, AutoCAD Architecture, Building Systems, or AutoCAD MEP.

[Refer to Technical Support Contact List.](#)



Avoid too much Documentation

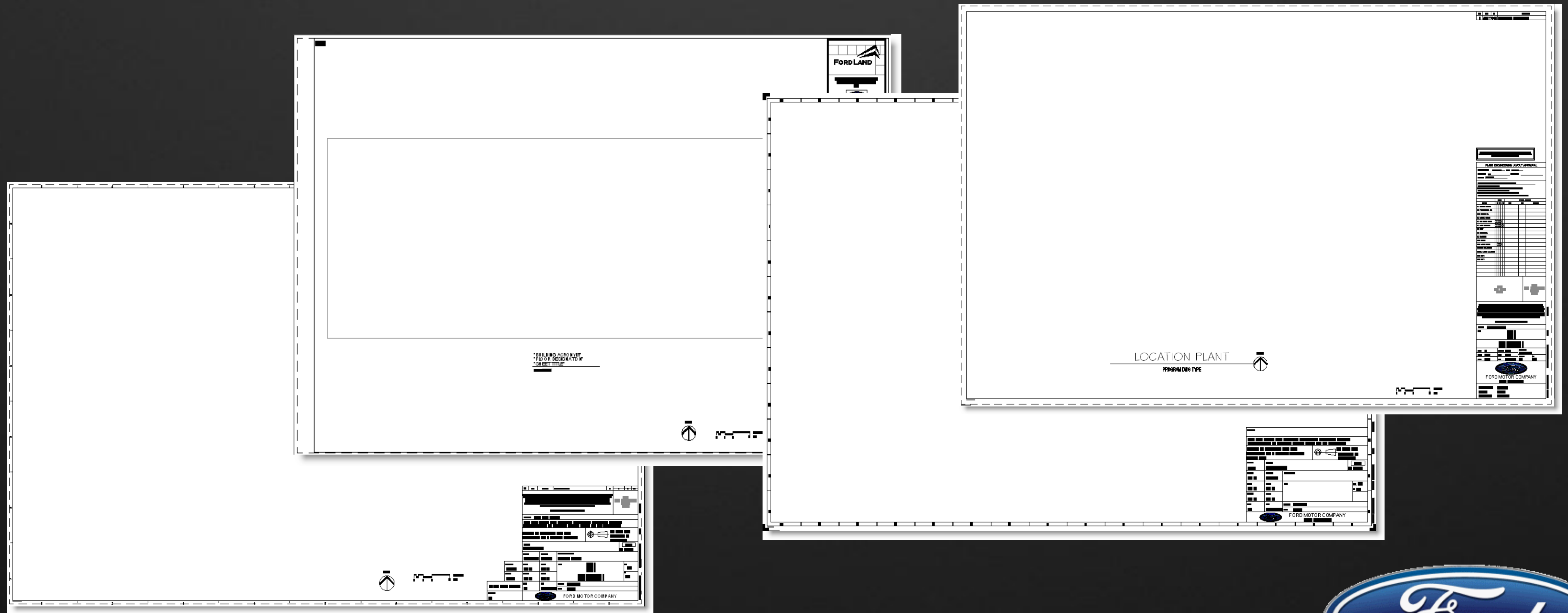


"HEY - 'YOU FINISHED WITH THE IN-HOUSE STANDARDS MANUAL FOR EFFICIENT CAD USE? "



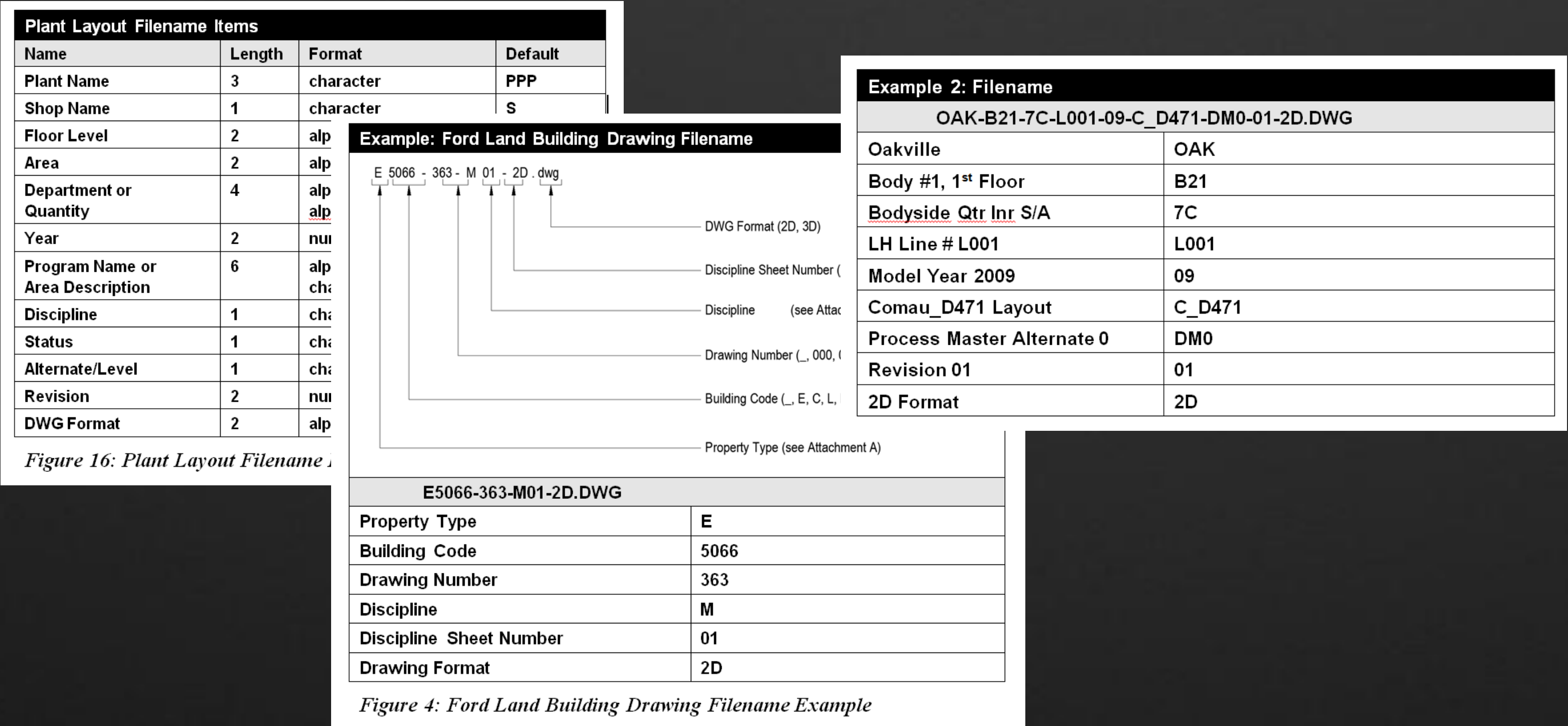
Efficiency: Standardization

Titleblocks



Efficiency: Standardization

Standard File Naming Conventions



Efficiency: Standardization

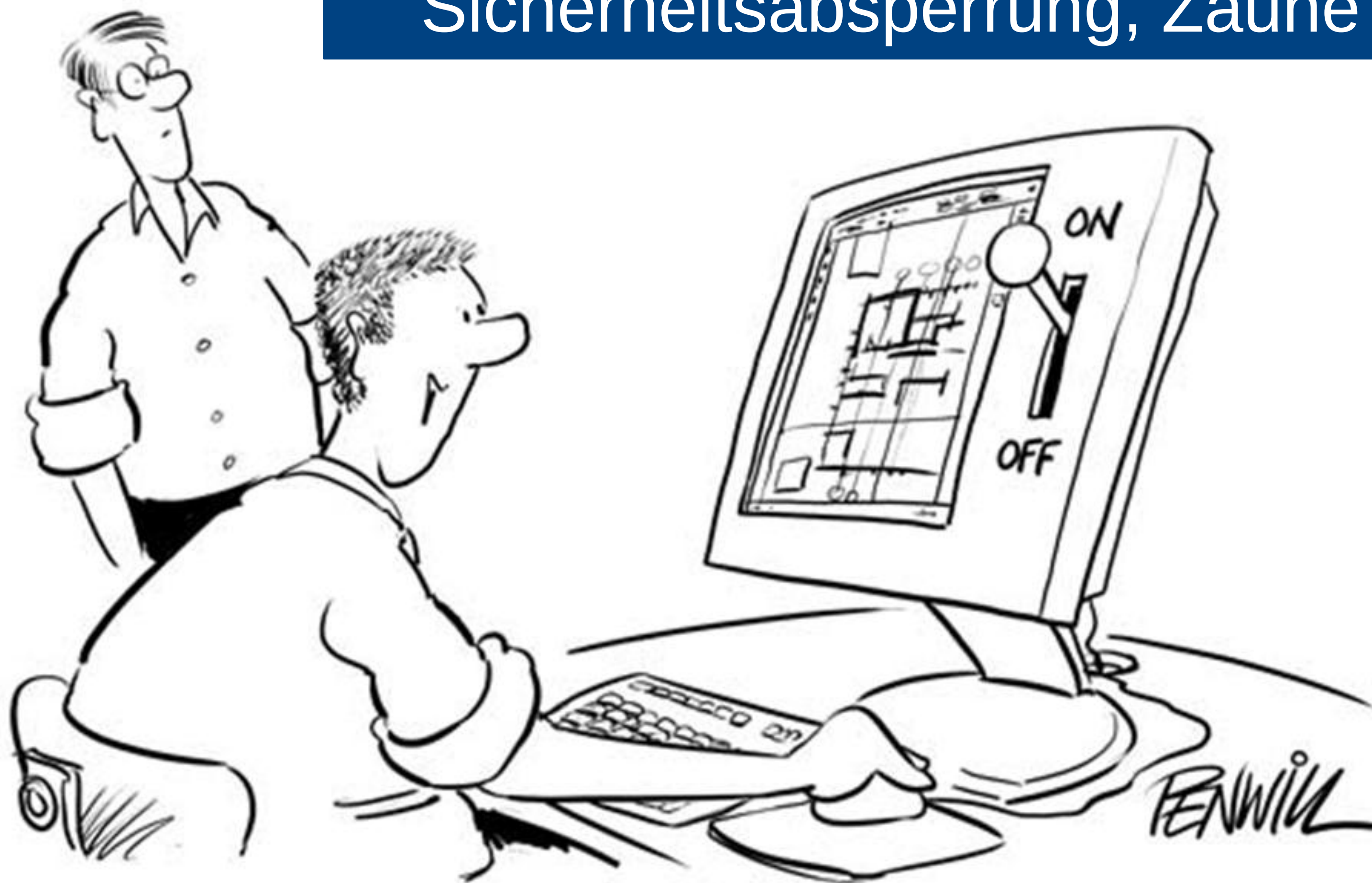
Standard Layers (multi-lingual)

German Description			Spanish Description	
Schriftkopf			Margenes y Letreros	
Bemassung			Dimensiones	
Flächeninformationen			Layer Name	Layer Description
Deckenkonstruktionen			A-ANNOT-B	Title Block Sheet Name and Number
Podeste			A-ANNOT-D	Dimensions
Treppen, Leitern			A-AREFL	Floor Space Information
Sam	NCS Layer Name	Layer De	A-CLGGR	Ceiling Grid
Dive			A-FLRRA	Raised Floors
			A-FLRST	Stairs, Escalators and Ladders
	A-AREA-SPCE	Area	A-FLRTR	Trenches
	A-CLNG-GRID	Ceiling: g	A-FUR	Furniture
	A-FLOR-RAIS	Floor: rais		
	A-FLOR-STRS	Floor: stair treads, escalators, ladders		
	A-FLOR-LEVL	Floor: levels, ramps, pits, depressions		
	A-FURN	Furnishings		





What goes on layer “Sicherheitsabsperrung, Zäune”



"IT'S DYNAMIC LAYER CONTROL"

“Security Fences, Fences”



Efficiency: Automation

Scales

Get Ford Layouts

Reset Metric Support Paths

Facility Layouts

Manufacturing Layouts

Plant Layouts Metric

Plant Layouts Metric (US)

Equipment A0 Layouts Metric

Equipment A1 Layouts Metric

Equipment DSIZE Layouts Metric (US)

Equipment ESIZE Layouts Metric (US)

Land Layouts Metric

Land Layouts Metric (US)

Land Presentation Layouts Metric

Land Presentation Layouts Metric (US)

Land Real Estate Layouts Metric

Land Real Estate Layouts Metric (US)

VO Layouts Metric

Scales

Get Ford Layouts

Reset Metric Support Paths

Facility Layouts

Manufacturing Layouts

Tooling Layouts Metric

Tooling Layouts Metric (US)

Tooling MINI Layouts Metric

Tooling MINI Layouts Metric (US)

Process Illustration Layouts Metric

Process Illustration Layouts Metric (US)

Controls Layouts Metric

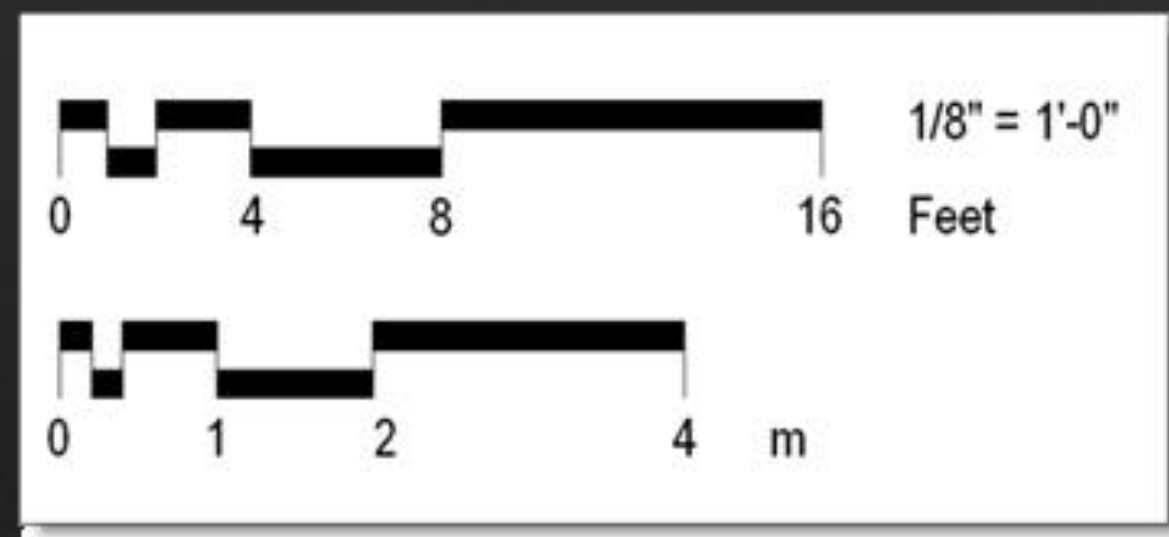
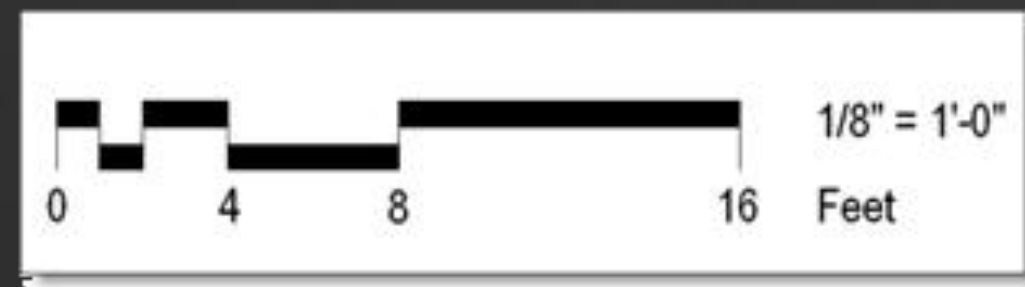
Controls MINI Layouts Metric

Collaborative Process Layouts Metric



Efficiency: Automation

Definitions and Samples



1:1
1:2
1:10
1:20
1:25
1:30
1:40
1:50
✓ 1:100
1:200
1:250
1:500
1:750
1:1000

VisibilityStateAllOn
Not to Scale
1/64"=1'-0"
1/32"=1'-0"
1/16"=1'-0"
3/32"=1'-0"
✓ 1/8"=1'-0"
1/8"=1'-0" Dual
3/16"=1'-0"
1/4"=1'-0"
3/8"=1'-0"
1/2"=1'-0"
3/4"=1'-0"
1"=1'-0"
1 1/2"=1'-0"
3"=1'-0"
6"=1'-0"
Eng: 1"=10'
Eng: 1"=20'
Eng: 1"=30'
Eng: 1"=40'
Eng: 1"=50'
Eng: 1"=60'
Eng: 1"=60' Dual SI
Eng: 1"=100'
Eng: 1"=125'
Eng: 1"=200'
Eng: 1"=200' Dual SI
Eng: 1"=250'
Eng: 1"=300'
Eng: 1"=400'
Eng: 1"=500'
Eng: 1"=1000'
Civ: 1"=0.5 Mile
Civ: 1"=1 Mile



Efficiency: Automation

Standard Variables

Common Dimension Commands	
Command Name	Description
DIMREGEN	Creates associative dimension objects that update automatically when geometric object is modified
DIMREASSOC	Associates selected dimensions to geometric objects
DIMSPACE	

Common Text System Variable Settings		
System Variable Name	Value	Description
MTEXTED	Internal	Enables the use of the “internal” text editor

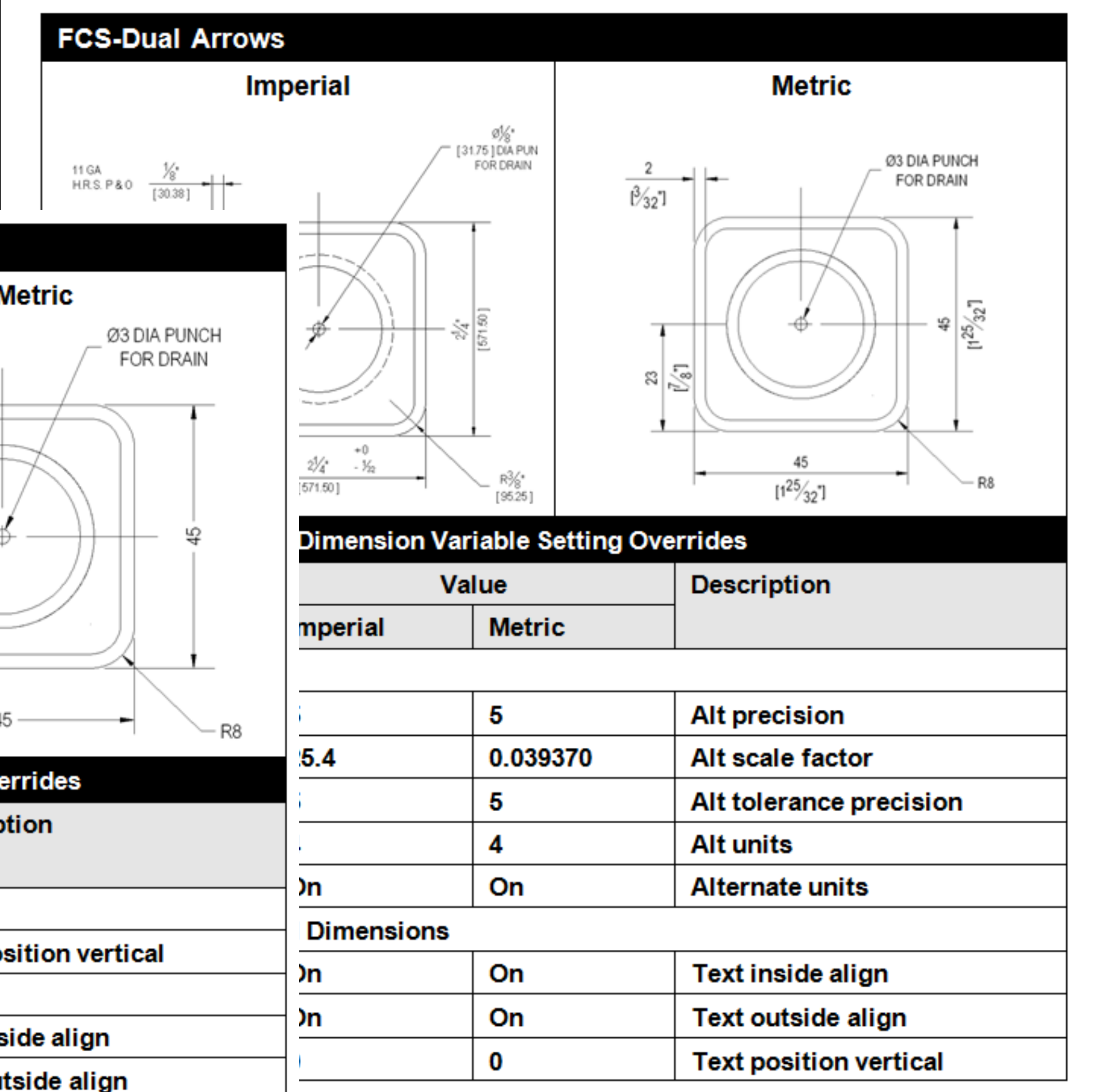
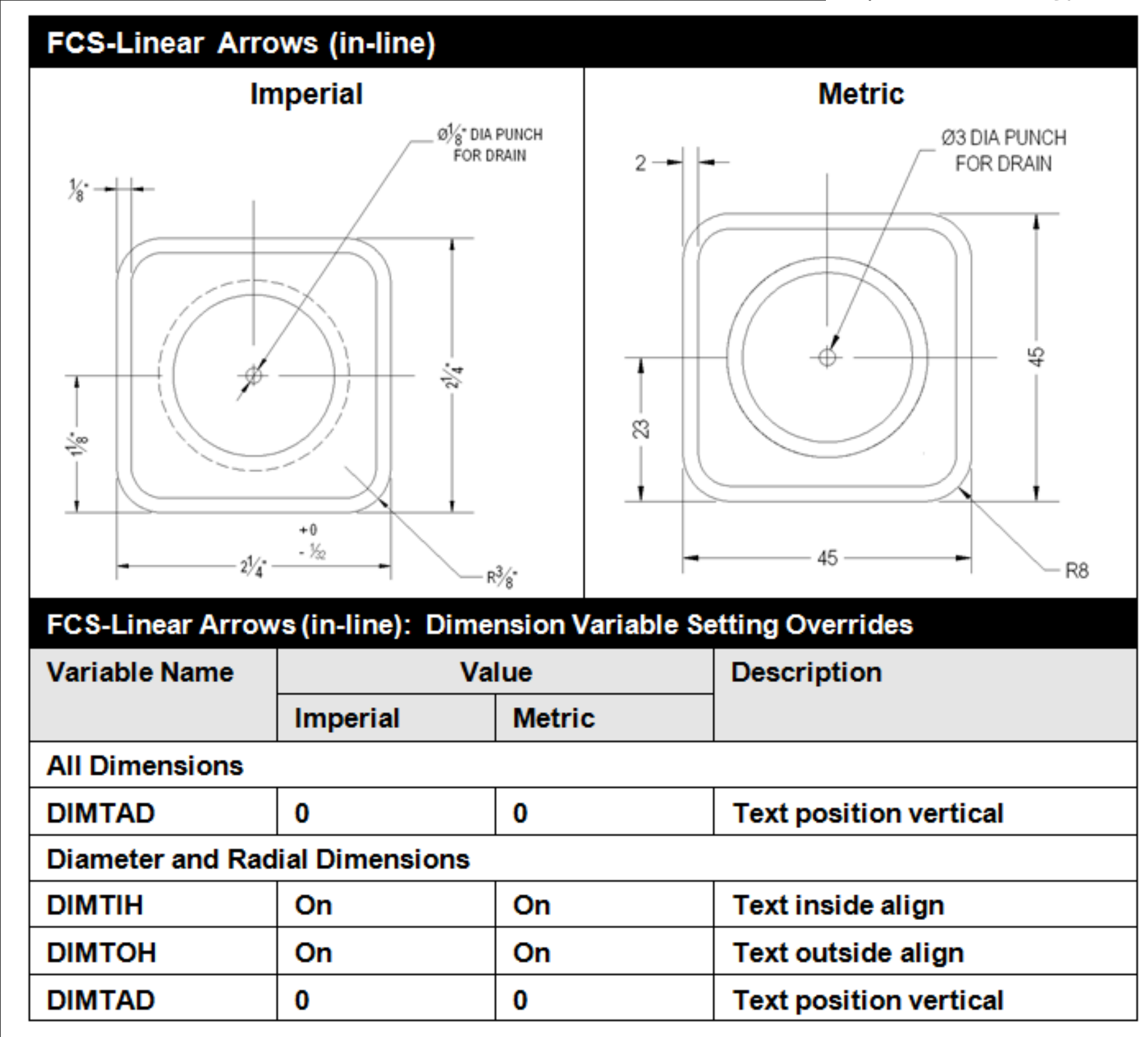
Common Dimension System Variable Settings		
System Variable Name	Value	Description
DIMASSOC	2	Creates associative dimension objects that update automatically when geometric object is modified

FCS-Linear Arrows (Standard): Dimension Variable Setting Overrides			
Variable Name	Value		Description
	Imperial	Metric	
	sions (cont)		
	-2	-2	Extension line weight
	3/32"	4.8	Dimension line <u>lineweight</u>
1	BYBLOCK	BYBLOCK	Dimension line spacing
2	BYBLOCK	BYBLOCK	No dim lines outside
		BYBLOCK	Extension line 1 <u>linetype</u>
		2.4	Extension line 2 <u>linetype</u>
		-2	Precision
		2.4	Text height
		3	Text offset
		0	Text position vertical
f	Off		Tolerance precision
	1		Extension line color

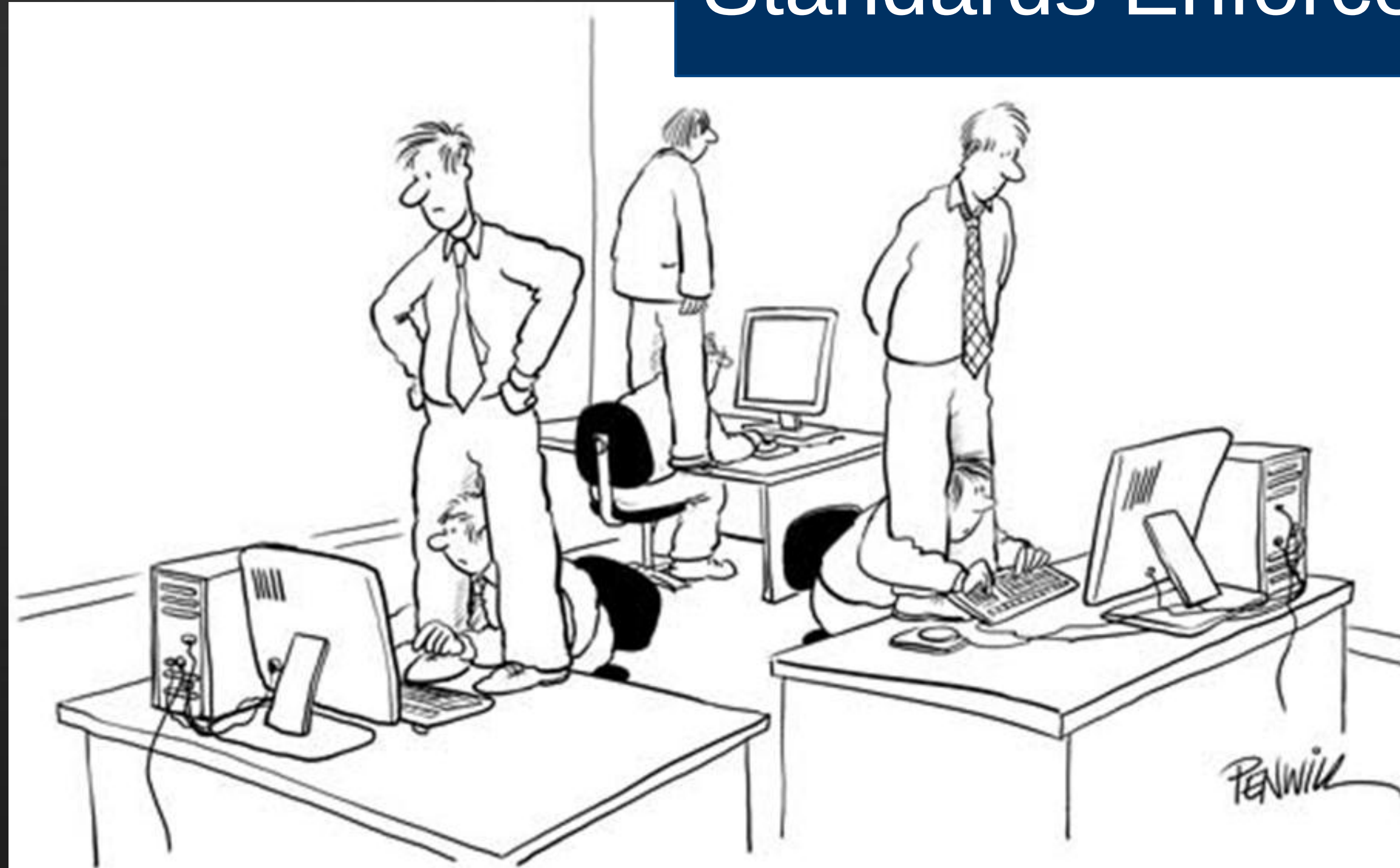


Efficiency: Standardization/Automation

Standard Annotation



Standards Enforcement



IN THE END, THE ONLY WAY OF KNOWING IF THE DRAFTERS WERE FOLLOWING THE OFFICE CAD STANDARDS WAS TO STAND OVER THEM

“Quality means doing it right when no one is looking”

Henry Ford



Efficiency: Enforcement



Best in class selection: CADconform from Altiva Software

What did the Ford team require in a CAD checker?

- Available drafting tools that can be incorporated into the AutoCAD menus
- Security at multiple levels of the user interface
- Available tools to easily locate and correct non-conformances
- A reliable indication of conformance to standards that can be published and recorded
- A proven enterprise solution

A review of what Ford required in a CAD checker and what was available in the market place resulted in the selection of CAD conform.

- Additional benefits:
 - Licensing and integration of the U.S. National CAD Standards within CADconform
 - Digital signature seal insuring a defined conformity level
 - Multi-file reporting capabilities
 - The ability to ramp up conformity. Having your files 100% compliant to your standards is not a one day event! Think months, or longer...



Organization

Open parking in a lot with no guidelines will eventually result in total chaos



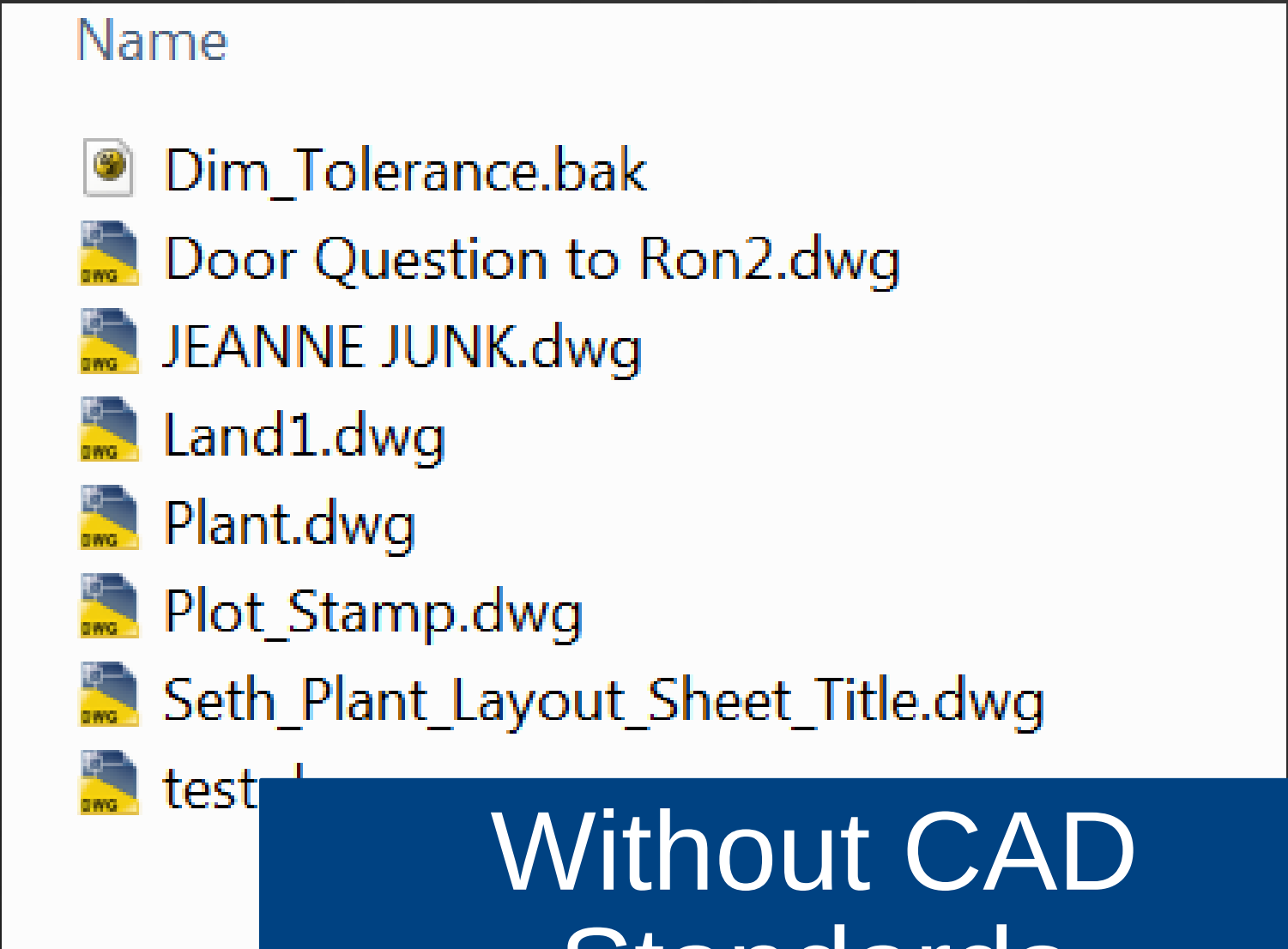
Organization: Resources

CUI Resources Demonstration

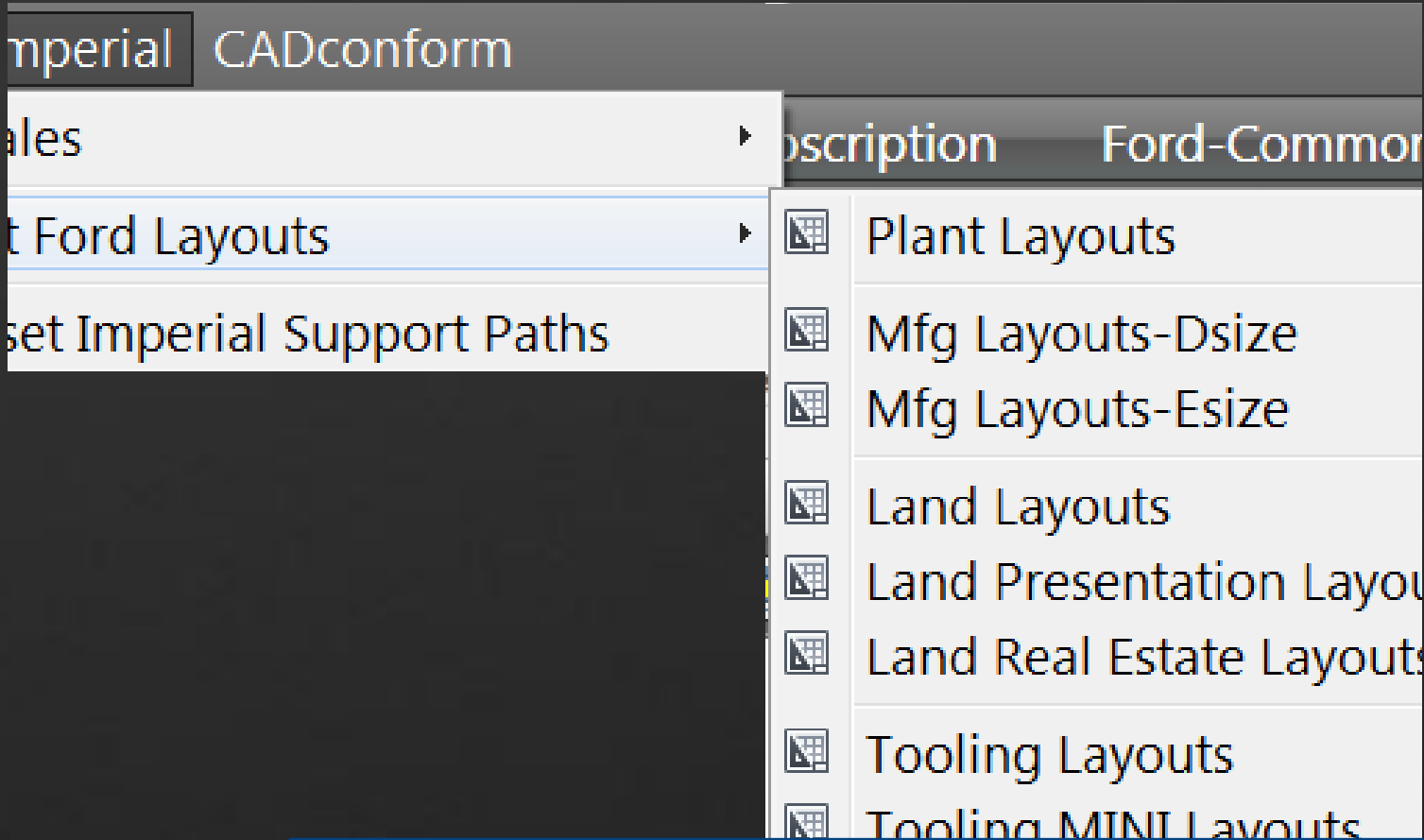


Organization: Resources

We All Work More Efficiently



Without CAD Standards



With CAD Standards



Organization: Resources

We All Work More Efficiently

Name	Description	O	F..	L..	Color
AM_7N		💡	🟡	🔗	cyan
AM_9		💡	🟡	🔗	253
AM_9N		💡	🟡	🔗	253
ANKERST-M40		💡	🟡	🔗	white
CLAMP		💡	🟡	🔗	91
CROWDERADVANCE		💡	🟡	🔗	43
CROWDERRETRACT		💡	🟡	🔗	36
Default		💡	🟡	🔗	white
Defpoints		💡	🟡	🔗	white
DV2_Standard		💡	🟡	🔗	white
FQZRXNHH7LPZ14_3		💡	🟡	🔗	white
HO_FLIP		💡	🟡	🔗	red
J2ZUULJ5QNRJSX_1		💡	🟡	🔗	white
LOWER		💡	🟡	🔗	red
M4_MUTTER_DIN934		💡	🟡	🔗	white
M5X20_1					
M6X16_1					

Without CAD Standards

Name	Description	O	F..	L..	Color
0	AutoCAD Block Use Only (DO NOT U...	💡	🟡	🔗	white
0-ANNO-NPLT	NON-PLOTTING General Annotation	💡	🟡	🔗	253
0-ANNO-SCRN	SCREENED items	💡	🟡	🔗	253
0-VPRT	Viewports - WILL NOT PLOT	💡	🟡	🔗	253
0-XREF	Xrefs:	💡	🟡	🔗	253
0-XREF-BLDG	Xrefs: Building (Ford Land)	💡	🟡	🔗	253
0-XREF-FURN	Xrefs: Furniture (Ford Land)	💡	🟡	🔗	253
0-XREF-LIST	Xrefs: Attached list	💡	🟡	🔗	white
Defpoints	AutoCAD ONLY	💡	🟡	🔗	white
G-ANNO-DIMS	Annotation: General Dimensions	💡	🟡	🔗	white
G-ANNO-EVAC	Annotation: Evacuation Plan	💡	🟡	🔗	white
G-ANNO-IDEN-FCAD	Balloons and leaders for FactoryCAD	💡	🟡	🔗	white
G-ANNO-LOGO	Annotation: Border Ford Logo	💡	🟡	🔗	253
G-ANNO-REVS	Annotation: Revision Objects	💡	🟡	🔗	11
G-ANNO-TEXT					
G-ANNO-TEXT-					
G-ANNO-TTLB					

With CAD Standards



Organization: Best Practices



Communication

- Define your objectives
- Then define what needs to be done to achieve your objectives
- Listen to your stake holders. Dialogue is a key enabler.

Standardization

- Document your process to achieve your objectives
- Then define how to employ the process

Communication

- Define the milestones that will achieve the objectives. Keep listening.

Implementation

- Give your users every resource to achieve the objectives

Communication

- Reward each milestone when it's achieved. Keep listening.

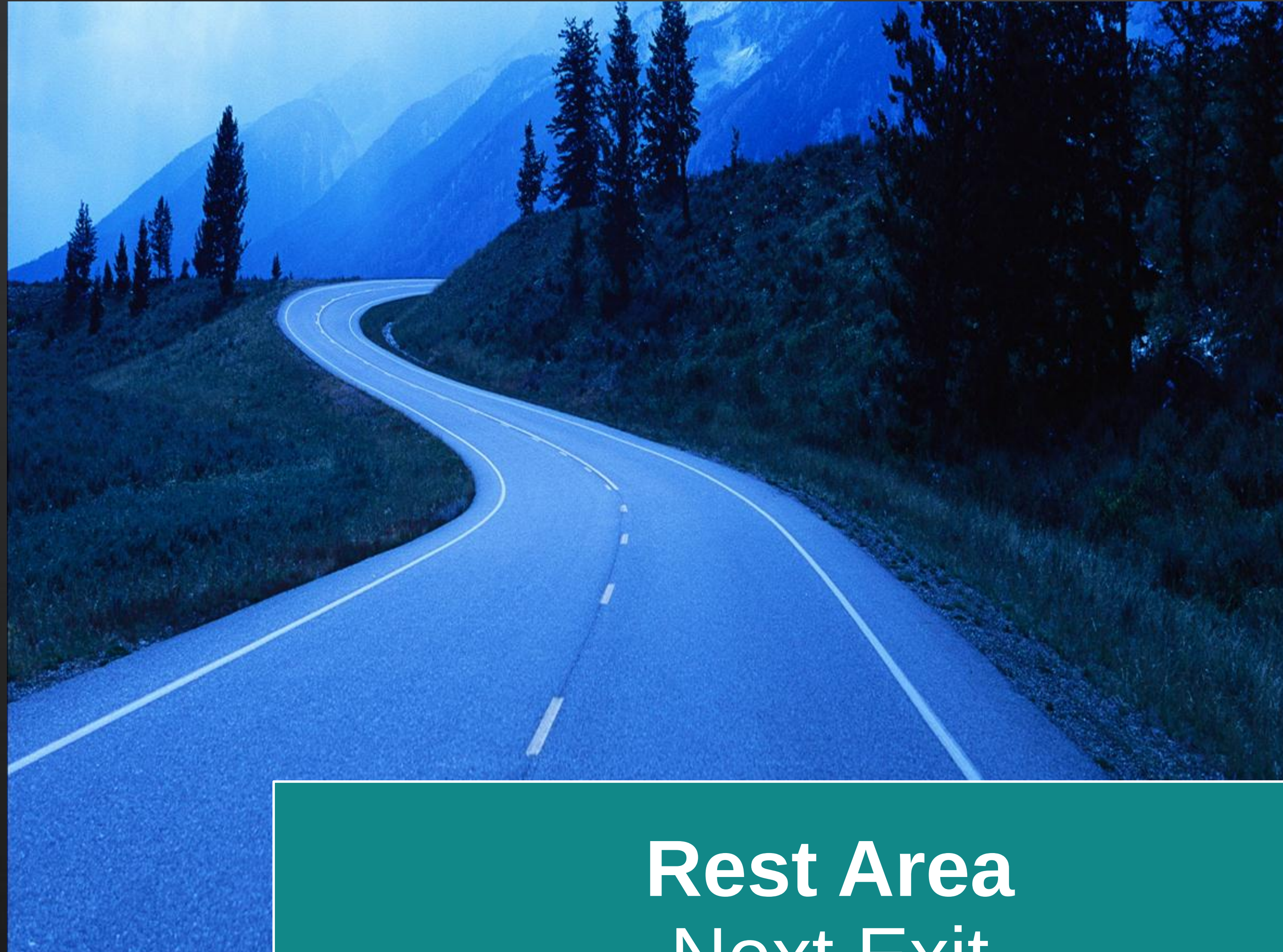
Enforcement

- Provide ownership to your people and they will enforce the standards

“You don't build a reputation on what you're going to do”

Henry Ford





**Rest Area
Next Exit**



Everyone STAND UP!!!!



SIT DOWN if don't own a car

SIT DOWN if your car is not an American made product.
If you don't know...
SIT DOWN!

SIT DOWN if your car is not a Ford or a Lincoln



Thank you
to all who are standing.



You WIN!!!!!!



Questions?



Thank You for Attending!

Don't forget to fill out your Survey....it matters!

Hope you ENJOYED this
Quick Trip through
Ford's CAD Standards!



