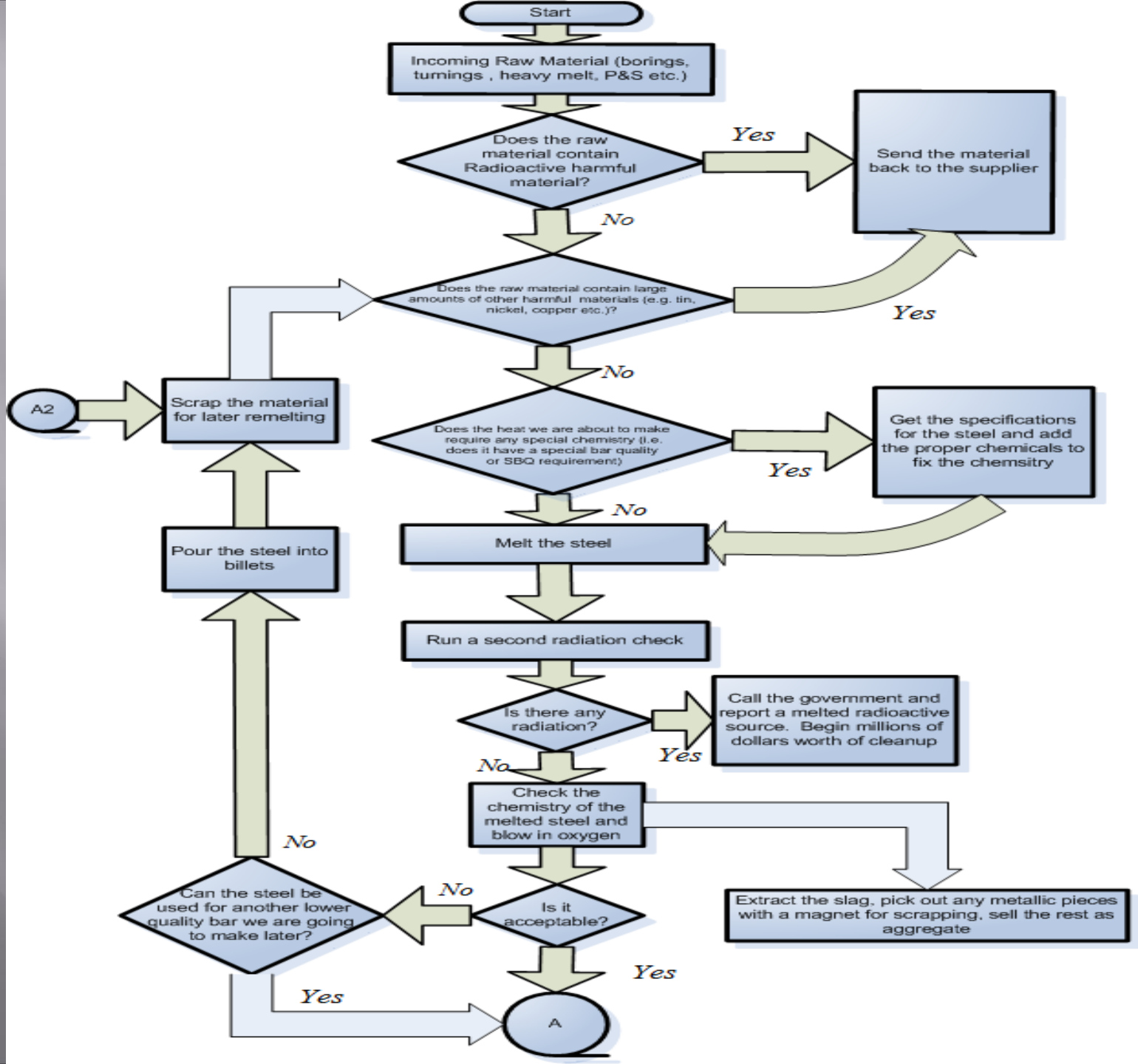
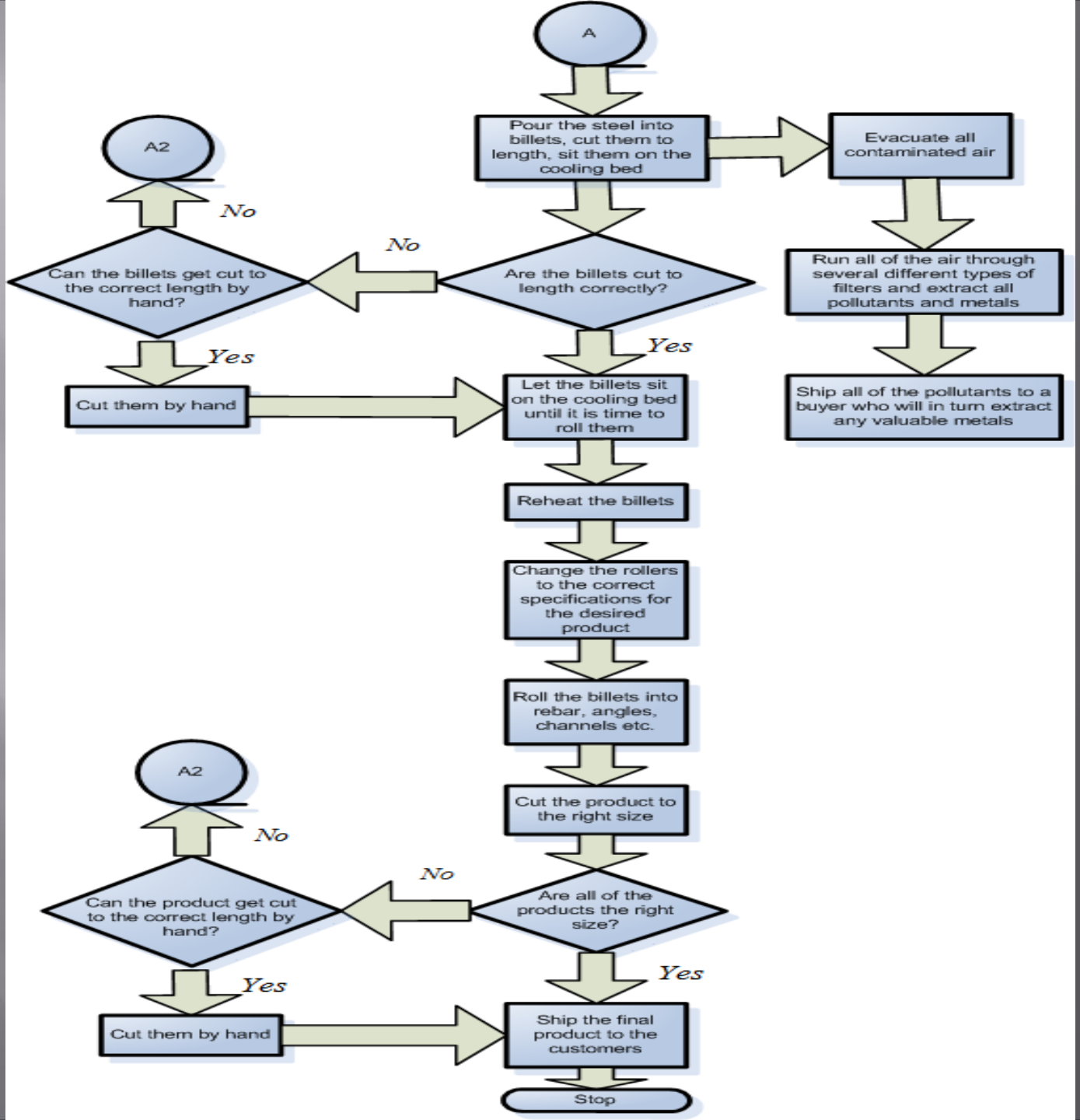
DFSS, & QFD / House of Quality

By Group 4


Start
Incoming Raw Material (borings, turnings , heavy melt, P&S etc.)
Does the raw material contain Radioactive harmful material?
Yes
Send the material back to the supplier
No
Does the raw material contain large amounts of other harmful materials (e.g. tin, nickel, copper etc.)?
Yes
No
A2
Scrap the material for later remelting
Does the heat we are about to make require any special chemistry (i.e. does it have a special bar quality or SBQ requirement)
Yes
Get the specifications for the steel and add the proper chemicals to fix the chemsitry
No
Pour the steel into billets
Melt the steel
Run a second radiation check
Is there any radiation?
Yes
Call the government and report a melted radioactive source. Begin millions of dollars worth of cleanup
No
Check the chemistry of the melted steel and blow in oxygen
No
Can the steel be used for another lower quality bar we are going to make later?
No
Is it acceptable?
Extract the slag, pick out any metallic pieces with a magnet for scrapping, sell the rest as aggregate
Yes
Yes
A


A
Pour the steel into billets, cut them to length, sit them on the cooling bed
Evacuate all contaminated air
Run all of the air through several different types of filters and extract all pollutants and metals
Ship all of the pollutants to a buyer who will in turn extract any valuable metals
A2
No
Can the billets get cut to the correct length by hand?
No
Are the billets cut to length correctly?
Yes
Yes
Cut them by hand
Let the billets sit on the cooling bed until it is time to roll them
Reheat the billets
Change the rollers to the correct specifications for the desired product
Roll the billets into rebar, angles, channels etc.
Cut the product to the right size
A2
No
Can the product get cut to the correct length by hand?
No
Are all of the products the right size?
Yes
Yes
Cut them by hand
Ship the final product to the customers
Stop

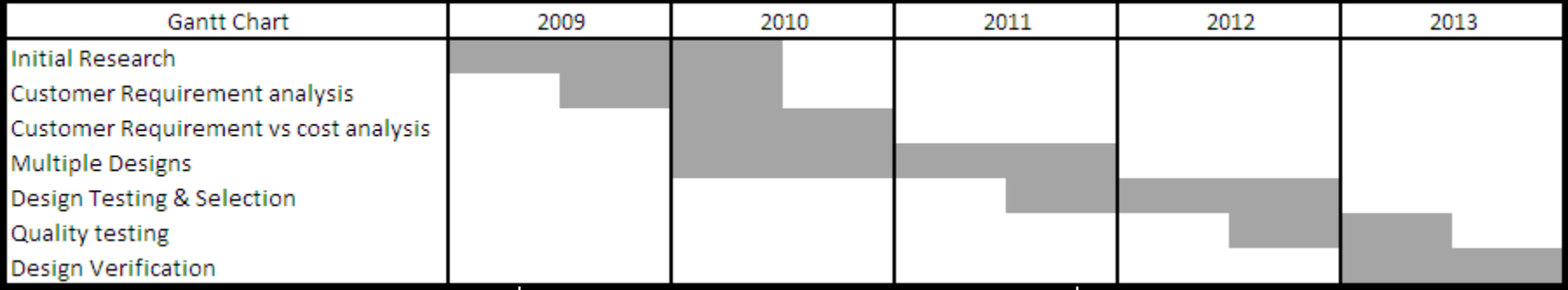
Our example:

Your boss comes up to you and says that he needs a new kind of rebar that is more durable than the kind the company currently produces

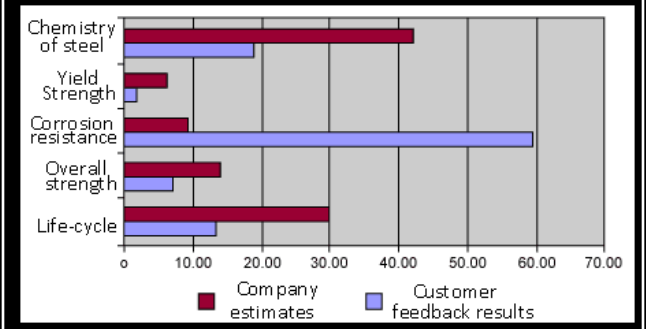
Following the design for six sigma (DMADV) guidelines, come up with a procedure to complete this project in a timely fashion.

STEP	TOOLS	OUTPUTS
DEFINE the project • Develop a clear project definition. • Develop organizational change plans, risk management plans, and project plans.	**Market Analysis Tools**: Mkt. Forecasting Tools; Customer Value Analysis; Technology Fore. & Visioning; Competitor Analysis. **Process Analysis Tools**: Control Charts; Pareto Charts. Project Planning Tools: Work Breakdown Structures; PERT Charts; Gantt Charts; Activity Network Diagrams. DMADV Specific Tools: Project Charter; In/Out of Scope Tool; Organizational Change Plan	Project Charter Project Plan Organizational Change Plan Risk Management Plan Tollgate Review & Storyboard Presentation

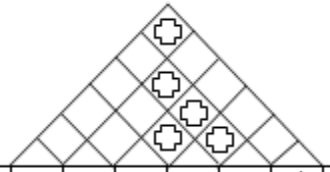
STEP	TOOLS	OUTPUTS
DEFINE the project • There is a need for a new kind of rebar which can withstand harsher weathering. • We would like to have this project completed in 5 years	**Market Analysis Tools**: The market has a large demand for this product and we forecast that it will take 10 percent of the market share once released and 5 additional percent the next 10 years. **Project Planning Tools**: Gantt Chart; Risk Management, best/worst case scenarios	Gant Chart Idea of where/when to deploy in the market Risk Management plan



STEP	TOOLS	OUTPUTS
MEASURE Customer Req. •Collect VOC (voice of customer) Data •Translate the VOC into design requirements - CTQs •Identify the most important CTQs. •Revise Risk Management Plan •If necessary, develop a multistage project plan.	Cust. Segmentation Tree Data Collection Plan Customer Research Tools: Interviews; Contextual Inquiry; Focus Groups; Surveys. VOC Table Affinity Diagrams Kano Model Perform. Benchmarking QFD (quality function deployment) Matrix or house of quality CTQ (critical to quality) Risk Matrix Multistage Plan	Prioritized CTQs Updated risk management plan and multistage project plan, if appropriate. Tollgate Review & Updated Storyboard

STEP	TOOLS	OUTPUTS
MEASURE Customer Req. •Customer wants: -Strong product -One that lasts a while -One that meets their building specs •This Means: -No decrease in overall Strength -High yield Strength -Corrosion Resistance -Long Life Cycle -Specific Chemistry	Customer Interviews Surveys. VOC Table  House Of Quality	Voice of Customer is heard and accounted for Prioritized CTQs -Corrosion Resistance -Specific Chemistry -Life Cycle -Overall Strength -Yield Strength

House of Quality



Strong 9 Moderate 3 Weak 1 WEIGHT **Customer Needs**	Visual Inspection	Specrometer Testing	Tensile Test	Hardness Test	Carbon Content Test	Billet Weighing System	Priority Score
Shiny Finish	9	3	1	1	1	1	2
Smooth to Touch	9	1	1	1	1	1	2
Strength	1	9	9	9	9	1	10
High Yield Strength	1	9	9	9	9	1	9
Consistent Color	9	1	1	1	1	1	2
Corrosion Resistance	1	9	1	1	1	1	12
Long Life Cycle	1	9	9	9	9	1	11
Tight Tolerances	3	3	1	1	1	9	9
Customer Specific Chemistry	1	9	1	1	3	1	12
CTQ Priority Score	35	53	33	33	35	17	
Target Limits	Smooth & shiny finish, no defects	Specific to product or customer. (usually High Carbon)	250MPA yeild strength 400MPA ultimate strength	About 120 HB	Customer specific, between 0 and 4 percent	Not below 3515 lbs, above several pounds is ok	

STEP	TOOLS	OUTPUTS
ANALYZE Concepts: • Generate, evaluate, and select the concept that best meets the CTQs within budget and resource constraints.	QFD Matrix: **Creativity Tools**: Brainstorming/ Brainwriting; Analogies; Assumption Busting; Morphological Box. Pugh Matrix Tollgate Review Forms	Selected concept for further analysis and design Tollgate Review & Updated Storyboard

STEP	TOOLS	OUTPUTS
ANALYZE Concepts: •Generate good ideas with brainstorming and then get rid of the ones that don't work	**Brainstorming:** To get the performance we could: -Use high carbon steel -Use a galvanized coating -Use Stainless Steel -Use composites	**Select a few concepts for further review:** -High carbon steel is a good idea -Galvanized coating is a good idea -Stainless steel is 400 times the cost -Composites will fracture **Pass:** -Stainless Steel -Galvanized coating **Fail:** -Composites -Stainless Steel

STEP	TOOLS	OUTPUTS
DESIGN the product • Develop the high-level and detailed design. • Test the design components. • Prepare for pilot and full-scale deployment.	QFD Matrix Simulation Prototyping Design Scoreboard FMEA / EMEA Planning Tools Process Management Chart Tollgate Review Forms	Tested and approved high-level design Tested and approved detailed design Detailed updated risk assessment Plans for conducting the pilot Completed design reviews and approvals Tollgate Review & Updated Storyboard

STEP	TOOLS	OUTPUTS
DESIGN the product • Develop the high-level and detailed design. • Test the design components. • Prepare for pilot and full-scale deployment.	Prototyping Planning Tools Process Management Chart	Tested and approved detailed design Build Proper facilities for deployment, modify current equipment Updated risk assessment, worst/best case scenarios for product deployment using updated and tested information. Reviews and Approvals

STEP	TOOLS	OUTPUTS
VERIFY Design Performance •Conduct the Pilot and Stress Test and Debug the Prototype •Implement the Design •Transition Responsibility to the Appropriate People in the Organization •Close the Team	Planning Tools Data Analysis Tools: Control Charts; Pareto Charts Standardization Tools: Flowcharts; Checklists; Process Management Charts	Working Prototype with Documentation Plans for full implementation Control Plans to Help Process Owners Measure, Monitor, and Maintain Process Capability Transition Ownership to Operations Completed Project Doc. Project Closure Final Tollgate Review & Updated Storyboard

STEP	TOOLS	OUTPUTS
VERIFY Design Performance • Debug the Prototype • Implement the Design • Transition from R&D to actual production line	Standardization Tools: Flowcharts; Checklists; Process Management Charts.	Working Prototype with Documentation Plans for full implementation New Engineering Controls Project Closure

Questions?

Sources & Additional Reading

House of Quality:

- http://www.webducate.net/qfd/qfd-hoq-tutorial.swf

  (If this link doesn't work… then google "www.webducate.net interactive house of quality" in Mozilla Firefox and click the first result.)

DFSS:

- http://www.isixsigma.com/library/content/c020722a.asp