7

Product and Document Release

The release of the product and its documentation should be an evolutionary process (see Fig. 5.9). Very shortly after the design and development begins, the service support planning and manufacturing process development should start. Design Engineering is developing the product, Manufacturing is developing the production process, and Field Support is developing the service and maintenance plans and process. Each is communicating its needs and plans to the others through the team. Each is presenting its needs for the drawing, specification and BOM. The team is costing the alternatives, and settling individual issues as they occur. They meet with the management to review progress on a regular basis.

Manufacturing needs the release of part documents first—in lead-time to produce. Engineering should accommodate that need to the maximum extent possible. Thus, documents should be released one or a few at a time—in lead-time. When a single drawing is agreed upon, it can be released. This is evolution of the product and its documentation. It is the fastest approach to new product release.

Life Cycle Phases

As this process takes place, the management (or your customer) will impose certain major milestones to pass. These milestones (or baselines as they are more frequently called) divide the project into phases. These phases

are called by different names at different companies. Our Loader Company will use the D2 - P3 terminology pictured in Fig. 7.1.

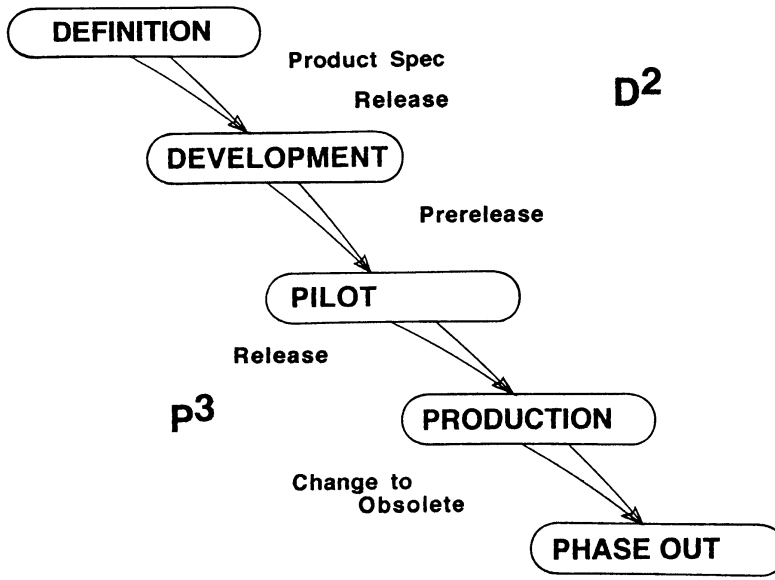

Figure 7.1. Product documentation release phases.

Some companies choose to have more or fewer than five phases. Make to print companies typically have two or three phases - contract / PO, sample/ qualification unit, and production. On repeat orders, samples may not be required. Some companies have a field operation phase. Some don't treat obsolesce as a separate phase. The "the line" between phases are baselines. In DoD terminology they are - Functional, Allocated and Product. You can give them your own names or refer to them as "development to pilot" baseline. The baselines are crossed in the Loader Company by release done on a blanket ECO. The distinguishing "event" (Product Spec Release, Prerelease, Release & Obsolete Change) between phases, is also shown in Fig. 7.1.

Rule: The phases and baselines to be used at your company need to be defined and agreed upon.

Reason: This is a matter of defining communications and management expectations. The people in a given enterprise came from different experiences and tend to use different terminology. However, they may or may not mean the same thing. Communication barriers start to come down with the definition of common terms.

Terminology varies in different industries and in different parts of the country. Regulators influence the terminology. What the Loader Company calls Definition might be "Contract" or "Bid" or "Product Spec." in another company.

Different parts of the company tend to look at the "correct" phases in terms of their own functions. Engineering will often define the phases and introduce phases that Sales or Manufacturing do not relate to.

Rule: The phases should be limited to the fewest practical for the total company.

Reason: Phases are defined for the total company - for the cross-functional team - not for any single function. They, therefore, need to be for the business unit, not for one function.

Rule: The phases should be established for the new product - not the "spin off" product.

Reason: This is the "worst case," the team can then make a decision to skip a particular phase that may not be applicable for a "spin off" product or a repeat order.

This question of company phases is critical and needs to be determined at the highest management levels of the operation. They should not be dictated by corporate headquarters to be identical in all business units.

Documents Tied To Release Phase

These are product and document life cycle phases. Since the product is defined by its documentation it is necessary to tie these phases to the documentation. Since the development of the product should be evolutionary it is necessary to be able to look at any single document and tell which phase it "represents." This is sometimes done by stamping the document. For example: "OK for Pilot Build." A simpler process is to use the revision block

to indicate the applicable phase. The diagram in Fig. 7.2 indicates how the product and its documentation are "tied together" by use of the document revision level.

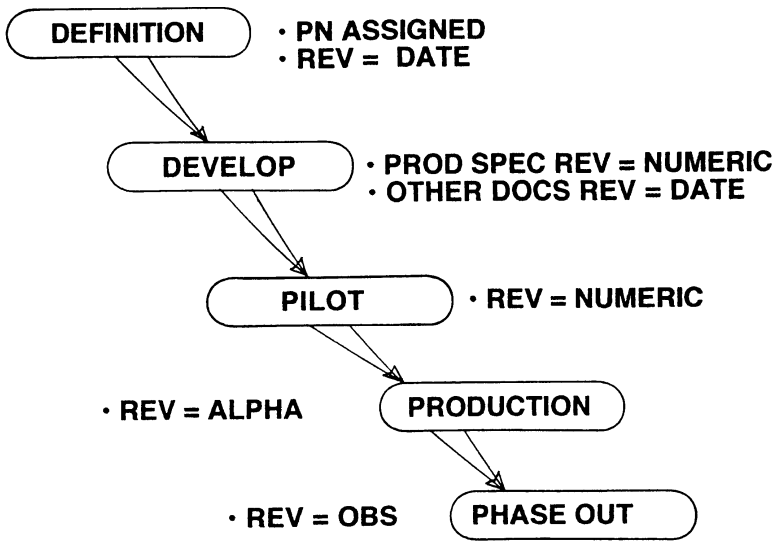

Figure 7.2. Release phases and revision levels.

In this case a blank or dash in the revision field indicates that the document is in the "definition" phase. This means that the designer will need to use the "date" field to keep track of the changes. In the "development" phase, also use a blank or dash revision. This choice is made purposely—to reserve the revision field only for CM use.

The Product Specification is an exception because it was pre-released (revision number control) the day after the project was started. In the pilot phase the documents will be a numerical revision. In the "production" phase, use the alpha revision. When it is determined that an item will no longer be produced, place a notation of "obs" in the revision field.

Rule: A standard is needed for a company that defines how to relate the revision block to the development phases.

Reason: It should be apparent by looking at a document, which phase it may be used in or is good for.

It must be kept in mind that the above refers to documents developed uniquely for this program. The program will use other items already released. Those items remain in a released condition. Sometimes companies reverse the roll of the alpha and numeric. That is OK providing they are consistent. In no case should a drawing or specification (that is under the engineer's control) be done by revision letters or numbers—the engineer controlled drawing should always use date control.

Having the ability to look at the document and know what phase it is "good for" is very important. It will avoid buyers or fabricators placing orders for production units when the part is only approved for pilot.

The Revision Block

As a result of these rules, the revision block on a particular document would, over time, look like Fig. 7.3. The phase history is, therefore, visible on the document.

REV	DATE	DESCRIPTION	ECO	SIGN
_	3-21-94	drafted	_	engr
_	3-29-94	redraw	_	engr
1 *	4-12-94	Released to Pilot	248	CM
2	4-17-94	Changed orientation	283	CM
3	4-20-94	Finish note added	280	CM
A **	4-27-94	Tested & Release to Prod	302	CM
B	5-11-94	Changed front tire O D	324	CM
C	5-30-94	See ECO	352	CM
D	4-20 95	Changes material	589	CM
OBS	8-04-02	Not used for new designs	2040	CM

* Move Master Document from Engineering to Master File and Start Informal Change Control

** Start Formal Change Control

Figure 7.3. Document revision block.

Life Cycle Phase Issues

It is also necessary to resolve many other issues in respect to the development phases. Just a few of those issues are:

- Location of and control over the "master" drawing.
- Whether or not the drawing will be microfilmed, digitized, etc. in each phase.
- Formality of the change control process.
- Associated MRP codes.
- Names to call the units built during that phase.
- Budget responsibility for the units built in that phase
- Kind of test that will be required to progress to the next phase.
- Kind of management and/or customer review required.
- Management and / or customer approvals required to proceed.

It is important to make a matrix of the agreed upon phases verses the "issues" as arise in your company.

Baseline - Phase Relationships

These phases need to be company/business unit decisions. That is, each product/project within the business unit should not make independent decisions. Allowing each program to develop its own rules invites chaos. The best way to develop these "release rules" is to write a standard that includes a relationship chart such as that in Fig. 7.4.

Rule: Every business unit should have a standard on "Product and Documentation Release" which includes a chart that crisply defines these relation ships. The chart must be void of lines/arrows crossing baselines. The standard and the chart must also be free of "ifs," "ands," or "buts."

Reason: The terminology and the tie between the product and its documentation must be clear. It represents the manner in which the evolutionary design process is to be monitored. Communications are much clearer.

A blanket release document would be used to indicate that the team has agreed that a particular item / document is "released" to the next phase. The document revision level would be changed by Document Control.

PHASE	UNIT NAME	CHANGE CONTROL	REV	DWG
DEFINITION (Concept)	Breadboard or Development	Engr	Date	Engr
PRODUCT SPEC BASELINE / PRELIMINARY DESIGN REVIEW				
DEVELOP-MENT	Prototype or Development	Engr	Date	Engr
DESIGN BASELINE / CRITICAL DESIGN REVIEW				
PILOT	Pilot Prepro Qual	Informal	Number	CM
PRODUCTION BASELINE / QUALIFICATION TEST REVIEW				
PRODUC-TION	Production	Formal	Letter	CM
PHASE OUT (Obsolete)	NA	No Longer "used on" any application	OBS	M'Film

Figure 7.4. Phase chart.

CM and The Release Process

The following may help to clarify the release process requirements. It is a reprint of an article by the author for the *Midrange ERP* magazine:

In previous articles, the proposition was put forth that a gap or wall often develops between Design Engineering and the rest of the company and that bridging that gap or tearing down that wall is the most important task of a

Configuration Management (CM) function. It was also proposed that CM tends to be whatever the management wants it to be. Where it all starts is in the CM release process—the process that a product manufacturing enterprise follows in the release of new products and their documentation.

The use of cross-functional teams is typically touted as the most important aspect of fast and successful new product introduction. These teams are, of course very important. In very small/start up companies or in "garage shop" development environments the team approach tend to happen naturally. All the functions represented in the garage are constantly communicating about the process that is and will be followed. But as the operation grows, difficulties set in. New people with a variety of backgrounds and experiences enter the picture. Even the meaning put on key words tends to be different. What a pre-production unit is to one, is a pilot unit to another, is a prototype to another. A meeting develops into disagreement or disarray and the cause isn't apparent. The answer is sometimes simply because words and terms have not been carefully defined.

Within your enterprise take a poll among key people in several departments and ask; "How many phases are there in your new product release process and what do you call them?" The results are eye opening! Ask "How do you know when you have progressed from one phase to the next?" Do you get questioning looks? Also ask "How can I tell by looking at a drawing or the database which phase a part number is approved for?" Has your company ended up with a quarter million dollars of useless parts in stock or on the dock because someone made/bought parts for production from a drawing that wasn't ready for production? These are all symptoms of a problem—confusion in the release process. Cross functional teams can help, but they need to know what the operations normal process expectation is.

First, determine the number of phases normally required on a new product development and what the enterprise will call them. Some possible phases (in the writer's terminology since there is no industry standard) are:

Definition / Bid / Contract / Specification Phase

Design / Development Phase

Pilot / Pre-production Phase / Qualification Phase

Production Phase

Phase Out / Obsolescence

Although five phases are listed, this is not to imply that they should all be used in any given enterprise. Some operations might require two and some

seven. A make to print company would have different phases than an aerospace company on a DoD contract. This decision must be carefully analyzed in order to arrive at the fewest necessary phases required for the operation. Engineering or Manufacturing or others may have sub-phases in their operations but the enterprise wide phase plan is most important to define. A different set of phases might be required for "spin-off" products as opposed to "new" product. Remember this is the normal expectation, the release policy should state how exceptions can be taken.

Example: "The team can skip or add phases for a particular product by noting in the team meeting action items list what is being done and why!"

Once the phases have been quantified and named, the next step is to prepare a chart to define numerous associated "issues." Let's take a generic company that normally needs three phases and decided to call them Development, Pilot and Production. The chart would address issues by phase:

	Phase		
Item	Develop	Pilot	Production
Name of Units	Prototype	Pre-Pro	Production
Number of Units to be built	3 to 6	20 to 30	Per Schedule
Build by	Engr	Pilot Mfg	Manufacturing
Serialized	No	under 100	over 100
Testing	Engr Lab	QA Reliability	Prod Test
Ship to Customers	No	After Upgrade	Yes
Location of Master	Engr	CM	CM
Signatures on Doc	None	Engr	Engr & ME
Revision Level	Date	Numeric	Alpha
MRP Status Code	D	T	P
ECO to Release	NA	Yes	Yes
Change Control	Engineer	Informal ECO	Formal ECO
ECO Signatures	NA	Engr & ME	Add Field & PC
Who Changes Master Docs	Engr	CM	CM
Signatures on Changed Master	Engr	CM	CM
ECO Distribution	NA	A list	B list
Interchangeability/PN chg rules	No	Yes	Yes

Add to and tailor the chart for your enterprise. Notice that there are no "ifs," "ands," or "buts" in the chart. Each line item or "issue" needs to be carefully analyzed in terms of minimizing control while also minimizing risks. The chart needs to be placed into a standard and published. An associated policy statement should be prepared to answer a number of questions about the release process that are still unanswered. Examples: How will the team authorize the release from one phase to the next? Will new documents be distributed or should those who need a new document be required to "pull" when needed. Can assembly documents be released to Pilot or Production before all its parts have been released?

Keep in mind that the entire product/all new documentation does not need to progress through the phases in a "bunch"—don't wait for release until all new documents are ready. The release can and should take place a document or group of documents at a time. Manufacturing needs the release of parts in lead-time to build. Engineering should release parts (documents) in their lead time sequence—30 week and longer items first, then 25 to 30, etc. Recognition of this simple concept causes many good things to happen, not the least of which is a step function improvement in release time.

This chart and the associated standard(s) are absolutely essential in clarifying the release process. Without it, a certain amount of chaos in inevitable. With this chart, cross-functional teams, the associated standards and the required training you can attain fast, accurate and well understood release of new product. Try it, you'll like it.

Product Definition Phase

In the Loader Company, the standard that describes the Definition Phase will address:

> The kind of testing that the breadboard model will be subjected to.
>
> That change control is in the hands of the responsible designer.
>
> That revision control will be only by date.
>
> The master drawing will be under the Cognizant Engineer's control.
>
> Pre-release of the Product Specification immediately after the project is approved.

A meeting(s) of the team with the top management (Preliminary Design Review) to examine the;

1. Latest product specification.
2. Test results and the breadboard model.
3. Product cost estimates, pricing, contracts, etc.

When the management (and the customer if applicable) approve, the Product specification will be "pre-released" (rev "1" & under formal CM change control).

Note that progress from the Definition Phase to the Development Phase is marked by two measurable milestones—completion of the Preliminary Design Review and of the Product Specification at revision #1. Successful passing of these two milestones constitutes passing the Product Specification Baseline.

Rule: When the management (and customer if applicable) determine that the preliminary design and Product Specification are acceptable, the Product Specification must be pre-released.

Reason: To document the fact that the Product Specification is agreed to and the date the agreement was accomplished. Track specification changes that might be made at the same time.

Notice that the Product Specifications is one phase ahead of all other design documents. This puts the document under informal change control and assures that the team is involved in any further changes.

Product Development Phase

The Loader Company standard for the Development Phase will describe that phase by addressing the following issues:

The kind of tests that are required for the prototype unit(s).

That change control will still be with the responsible designer (except the Product Specification).

Revision control will continue to be done by date only (except Product Specification).

The drawings remain in the designer's hands (except the Product Specification).

The designer and the field support person will make a pre-released spares item list.

A meeting of the Design Team and the top management to examine;

1. The latest Product Specification.
2. The Prototype Unit and the test results.
3. The evolving BOM, cost roll up, pricing issues, etc.

If management (& customer if applicable) approves, the remaining drawings and specifications must now be pre-released.

The Product Specification must be revised (Rev A) because; "critical design review is complete and the team has agreed that the product is ready for Pilot Production." This should be done whether or not there are changes to the specification.

Item by item prerelease by lead-time is encouraged. At prerelease the revision changes to numeric (Rev 1 description of change = "pilot prerelease"). The drawing is now under informal change control. The master drawing goes to CM "vault" control.

Note that progress from the Development Phase to the Pilot Phase is marked by three measurable milestones: completion of the Critical Design Review, pre-release of the remainder of the drawings and specifications, and revision of the Product Specification. This constitutes passing of the Design Baseline.

Rule: When approved to pass the Design Baseline, all the master drawings and specifications must be in CM. Informal change control will now be administered by CM. (Except the Product Specification which is under formal change control)

Reason: To document the completion of the Critical Design Review and the date it was accomplished. Tracking of progress is visible on the documents. Minimize risk.

Just as the Product Specification can and should be released prior to the Preliminary Design Review, so should some of the drawings be pre-released prior to the Critical Design Review. After all, this process should be an evolution—not revolution. The long lead items should be pre-released to allow purchase of the pilot parts. Parts or assemblies used from existing designs would have been previously released. Evolutionary pre-release must be encouraged to avoid bunching the work and the resulting delays.

Product Pilot Phase

In the Pilot Phase, the Loader Company will address the following in it's standard:

The kind of tests that are required for the pilot unit(s).

That informal change control will be with CM.

Revision control will be numeric.

The master drawings must now all be under CM's control.

Formal release on an item by item basis by lead-time will be encouraged.

Engineering and field support will review the spares item list for release.

A meeting of the team and the top management to examine;

1. The latest Product Specification.
2. The Pilot Unit(s) and the test results.
3. The latest costed BOM, pricing issues, etc.

If management (& customer if applicable) approve, the remaining drawings and specifications must be alpha released.

The Product Specification will be revised (To the next alpha revision), whether or not changes are made.

Progress from the Pilot Phase to the Production Phase is marked by three measurable milestones: completion of the Qualification Test Review, all drawings alpha released, and the Product Specification revised (next alpha character). This constitutes passing of the Production Baseline.

Rule: The product must be approved and listed by any and all certifying agencies prior to formal (alpha) release. The end product document (top level) shall not be alpha released until such approval and listing has been obtained.

Reason: Product liability risk too high to do otherwise.

Rule: All critical components must be qualified (tested) before formal release. Design Engineering, Manufacturing and Field Support must agree on which components are critical.

Reason: Assures the repeatable quality of the component and assures that there is an agreeable method of testing it.

Rule: No assembly may be formally released (alpha rev) until all its part drawings, assembly documents, specifications and referenced documents have been formally released.

Reason: Minimize the risk. Keeps people from being misled by the revision status on the documents or in the MRP system.

The production of the product entails significant dollar expenditures. It should be done only if confidence in the design is high enough to formally release. The product cost is now very quantifiable. The BOM is in place and cost can be accurately "rolled up." Notice that the product cost is a subject for constant review as the product design, the drawings, and the BOM evolve.

The design and development budget authorization should also be a subject of constant review. This helps to assure cost within goals. It also aids the evolutionary release progress by authorizing spending for portions of the next phase—long lead items, tooling, etc.

Product Production Phase

The drawings and specification masters are under CM control. The letter revision is used. Formal (but fast) change control will be used. If the

Design Team has done its job well, fewer changes will result. The product will be manufactured according to the master schedule/orders. The Loader Company will now prosper from the profits on this product.

Product Phase Out

Lastly, when the product is no longer to be produced, the Loader Company will:

Check the Used On for every item.

Those items unique to the obsolete product, will be revised by ECO to indicate "Not used in current production" in the reason for change block and enter "OBS" in the revision block. We will also refer to the part (if there is one) that replaced the obsolete one.

Should a use for the part arise in the future the document will be revised to reverse that process for the using program.

Several other issues arise in this phase that are highly individual company dependent:

The definition of "obsolete," "superseded," "cancelled," "redrawn," etc.

What if an item is still on a spare item list but is not in production?

Is the replacement part new to old interchangeable?

What do applicable regulating agency specifications require?

What are the company support life requirements?

What are the liability issues?

All of the related factors must be analyzed and definitions written accordingly. The manufacturing and service functions need to agree with engineering on these definitions. They both have possible stock purges to accomplish. Service may have manuals to revise, etc. The significance of this "phase" is dependent upon the complexity of these and other issues. The action required is usually to make a document change (by the normal change process) in order to implement the necessary terminology into the database, on the face of the drawing, and/or in the revision block.

Rule: Look for obsolesce (not used in current production) of each deleted part on each design change. If A deleted part has no used on, obsolete it as part of that change.

Reason: This is a key to making "phase out" a practical day to day event.

Management of the Release Process

Written approved standards allow the company to proceed with the development in an orderly fashion. It is not a reason to expect every product to be done identically, however. The management and the team can use the standard to manage by exception.

Example: Since the FEL-200 is a "spin off" of the FEL-100, management may choose to bypass the Definition Phase by starting the project with a "dictated" product specification.

Example: The management may have high confidence in receiving Underwriters Laboratory approval, and may therefore decide to alpha release and to risk building deliverable units expecting agency approval prior to shipment

Example: The team might determine to build fewer than normal pilot units because fewer units are needed for reliability testing.

Companies may and do make many exceptions. But this should not be a reason to do without a standard. On the contrary, a standard will yield understanding as to what is to occur if there are no management or team exceptions. Give all involved the normal condition against which to consider exceptions. **The standard therefore is the basis for "management by exception."**

Many companies may decide to proceed even if all the rules have not been met. This should typically be done by a written and approved Deviation.

Any company without a phase chart and standards will tend to have a totally different method used on each product it develops. The confusion

will tend to lengthen the development process. It has been demonstrated to this writer's satisfaction that it is better to have a documented method and to be flexible about its application than to have the "variable by whim" method.

MRP Status Codes

Most BOM systems have the ability to identify part numbers with a "Status" code. This code is usually in the item master file (database). It will typically print out on key reports, such as the Purchasing Decision Reports.

Different codes/acronyms are used in different systems. In one case, the MRP/ERP system has three codes - NIS, PRE, and REL. Include in the release standard, a definition of each. The definition must be compatible with the document release revision status. Example:

NIS = Part Number Assigned but not pre-released.

PRE = Numeric Revision, is pre-released.

REL = Alpha Revision, is released.

This allows the status of the part (in MRP/ERP) and the status of the document (Rev) to be compatible. This is very important since some people typically refer to the MRP/ERP while others typically refer to the documents. The coding in the database is for everyone to see and it is another necessity to "bridging the gap." (Also see Ch. 5, Fig. 5.2)

Release Form and Signatures

Some companies design a special form to accomplish the release of a drawing, spec, etc. The information that must be captured for any release is:

Product and/or project number.

Reason for release. (Production Release, Phase out, etc.)

Revision level (numeric or alpha).

Approval (s)—might only be on the documents being released.

Document or part number(s) released.

Test record per the applicable baseline.

Dates of release. (Dates on the documents may be days earlier than the actual time of release)

Management/Team meeting that gave authority to pass the baseline. (optional)

Number (control or form sequence number for tracking back to the above).

When parts are released, they need not have a "home"—such as long lead items released prior to structuring. The top level can be a temporary "home." The formal Used On relationship will come when a parts list is released.

Almost every element above must already be on the design change form (ECO). Because of this overlap, the same form is often used for release and change. This issue is very much a matter of a personal preference. Thus, if your company has a separate form or uses the same form, and it works, don't change it.

If you prefer a separate form, layout the above information and you will have a sound release form. The release form is also a very good automation application. Put it on line for distribution. A consistently formatted email message serves this purpose well. Since signature(s) should be on the documents being released, there should be no need for signatures on the release document. The CM technician's name should appear on the form/email to indicate responsibility for the accuracy of the release list and that the rules (Check List) have been followed (or that exceptions have been noted).

This is a very good application for a "blanket" (ECO) release form. This is the practice that the Loader company will use. A pre-formatted ECO will have a "log" to allow recording of each release as it occurs. The same ECO document will be used to release all the items required for the FEL-200. Items will be released one or more at a time and added to the blanket ECO "log" and redistributed once a week.

Some believe that no form at all is required to release. Items 1 through 4 above can (and probably should) be handled on the released documents. The team meeting reference (#8) is optional. That still leaves a need to find out when the actual documents passed to CM (since the dates on the masters may, and often are, "old"). Having no form begs the questions: How do those who need to know find out that the release occurred? How do we track what happened some time later? If data entry to a particular data processing

system produces a record of these things that is available for all that need to know, than that record is a release form.

The proper "acceptors" signature must either be on the released document or on the release form. One "acceptor" from manufacturing should sign either the document or the release form. All too often engineering "releases" an item that manufacturing cannot verify at receiving inspection (test) for example.

Release Checklist

In order for any release to be accepted into CM, it should pass a check—accept/reject point. The checklist will be different for each baseline. The list can be prepared from the baseline standard. Put the checklist into the Release Standard, and have it approved by the appropriate top management. This checklist should have a series of crisp yes or no questions. A partial checklist for formal release follows:

Have all drawings been properly signed?

Are all drawings / documents in accordance with the applicable standard(s)?

Are marked up drawings (for "same as except" conditions) in accordance with the mark up standard?

Are all the design reference documents included or previously released?

Have standard parts and assemblies been used where possible?

Before an assembly is alpha released, have all its parts been formally released?

Before the product is alpha released;

Has everything in the structure been alpha released?

Has the management approved baseline requirements?

Has applicable agency approval been obtained?

Have all the document numbers assigned to the project been accounted for? (need not hold up product release)

Check lists are thus a summary of the requirements in the standards that you judge to be significant enough for a CM check.

Rule: Every company should have a set of agreed upon release criteria put into a standard in the form of a checklist.

Reason: To attain a release by release auditing of standard (normal expectations) release requirements.

Rule: Before an item can be formally released, it must pass the checklist standard. If it fails any part of that checklist it cannot be released. CM assures this.

Reason: The agreed upon requirements must be met.

Application of a well thought out and agreed upon checklist will aid in management by exception.

Closing the Gap in Pilot

The team can help close the gap between Design Engineering and the rest of the Company. The tendency is to dissolve the team when the Pilot Production Phase starts. "We're done with that design, now let us move on to the next challenge." This is the worst possible thing that can happen. If fact, the team should not only stay essentially in tact during pilot, but:

Rule: The team should move physically into the pilot production area. Perhaps not every design engineer but certainly the Project Engineer and all the non engineering representatives should move lock, stock, and desk into the pilot area. This includes the CM representative if he or she is dedicated half time or better to the project. They should continue to meet regularly.

Reason: The team spirit that has developed must be held together until the design is built and tested by production workers. Problems will arise and the communications are much faster and more accurate when these people are together.

If the team has functioned well to this point, the volume of problems/changes resulting is relatively low. However, problems will still occur. The

design change process is administered by CM during the pilot phase. It should be informal (under numeric revision control). This might mean that only the Design Engineer and CM are required to sign the change. At the very most, one Manufacturing representative may be added to the sign off. Notice the assumption that pilot units are built by production personnel. This is essential to prove that the design is manufacturable and to train key production personnel.

When released to production, the Manufacturing Engineer and the production personnel should rotate into production. The team, although diminished in numbers, should move to their normal area but still meet frequently—probably for shorter meetings. This is critical to good communications and training of the new people involved.

In this author's view, one of the most significant mistakes company's make in the release process is to try to get along without a recognized pilot phase. Engineering will often build more units that are required for design purposes and do reliability testing on them. Unless the products are very simplistic it is much better to recognize the phase, have engineering build fewer "prototypes," have manufacturing build the pilot units and test them.

Catch 22

As time progresses, prerelease or production release occurs and the change control process must begin. If the release or change processes are slow and cumbersome, the engineers will be reluctant to release the documents. They will tend to hold them and release them in "bunches" only when absolutely required (forced). If this is done, there will be times when little is occurring and times when batches of documents are released together.

This batch method slows the process. In turn, the engineers view the slow release and change progress as reason to hold documents under their control as long as possible. If the change process is cumbersome, it amplifies the batch affect. Usually the company finds a way around the slow release process by, for example, using a deviation to release long lead items. Again we have two methods for releasing when one would do—if the single method is easy and fast. It is therefore critical that CM design and implement fast release and change processes. Much more will be said about the fast change process later.

The Release Process

As previously discussed, the release process must be evolutionary. It must be in parallel with the design and a team process. The document release process must handle a single drawing, assembly documentation, a group of parts, documents or a combination of these.

The checklist will vary but the process can be the same for any phase. One systematic way of quickly releasing documents is needed. First, examine the tasks that need to be performed during this release system.

Release Process Tasks

For the Loader Company, the release process will use the change form with only the minimum release blocks completed. On this form (or on the documents to be released), will be indicators about the following activities:

Start Project – The allocation of funds for a design and development project, completion of design and development constitutes start of pilot, etc.

Review Design Concept – Early on in the project the team should review the design concept. This might first occur when the product specification is "pre-released." It will occur again on release to pilot or production.

Release Product Spec – As previously mentioned the product spec is to precede all other documentation by one phase.

New Document(s) Complete – Preparation of one or more drawings, specifications, etc. according to the company drafting standards and on the CM approved format(s). Done by Design Drafting under the engineer's responsibility.

Modeling and Testing Complete – Engineer indicates that the testing required by the applicable baseline has been satisfactorily completed. The testing might be for a component, assembly or the entire product - whatever level is being released.

Blanket Release Form – CM cuts a blanket ECO for each baseline phase release. Document by document release will be "posted" to that ECO. The "required information" is minimally the part numbers being released and the date of release (may be some

time after document signatures are dated). The "form" might be an on line record in PDM or MRP / ERP.

Review Model, Tests & Documents – The team review the applicable items for the part, assembly or product being released.

Documents Signed – The signature of the Design Engineer who created the document in the title block. By policy, that engineer is required to sign after the team has reviewed the document. This gives an opportunity to incorporate ideas from the rest of the team without the "attitude of ownership" that comes with signature. An acceptor, usually the Manufacturing Engineer must also sign the document.

Check, & Technical Release – CM immediately reviews the package against the checklist. This is a "go"—"no go" point. If all items are acceptable, CM will proceed. If any item(s) are not acceptable, the specific requirements are noted and the item release is rejected.

Rule: Once passing this check, the release will not be stopped, revised, put on hold, etc. The release has passed a point of no return.

Reason: Discourages frivolous release actions.

If all items are checked and correct, the CM Technician immediately assigns the applicable revision number or letter and posts the part number(s) and date of release. This is an indication that the release is technically acceptable and has passed the necessary check.

The documents being released will not be reproduced and distributed. Rather the release notice should be the user's notice to pull the required documents as needed, when needed. This is using a "pull" system as opposed to a "push" system. This saves time, cost and trees.

Support & Process Documents – The applicable support documents (catalog, maintenance manual) and process documents (fabrication instruction, routing, assembly instruction, tool drawing, etc.) are created as a result of the release—a next step. They were not previously part of the release package. When the support documents are complete, a notification of that event is announced by the Publications/Service Doc Control function to all who need to know. When the process documents are complete the

Manufacturing Doc Control function will notify all who need to know. Again, email is an ideal tool for such notification.

Input To MRP / ERP – All design item data and assembly data must be input to the database. CM will compare output report to the input parts list in order to assure the accuracy of the data. CM will do this for all design elements. They do not hold entry while waiting for manufacturing data entry or support data entry. Those activities occur as a result of the release—a next step.

Back Up File & / or Microfilm Complete – CM assures that all items to be microfilmed, imaged, digitized or are otherwise preserved.

Close the Loop – The various functions noted above have notified CM of the completion of their tasks. As each notification is received, CM notes the date. When all are received, CM closes the release.

The above list constitutes the elements of the Loader Company release process. Most engineering functions believe that when the drawings are available for users, they are done with the release. This is a myopic view. The job is not done until other tasks are completed, at least the input to MRP/ERP.

This list of tasks implies some procedural steps, but are not complete from a process standpoint. The temptation is strong to merely put this list into a written procedure (standard) and sit back and relax. After all, they are the tasks that need to be performed to release aren't they?

Release Procedure / Flow Diagram

If we numbered these activities, one through thirteen, we could then boast that we have a procedure. Indeed we would. It would be a string of thirteen tasks in series and would probably be performed in that same sequence. Performed in number order, it would be the longest possible path for release—a series process.

This would not constitute an efficient system, however. To create an efficient system one question needs to be asked. "What is the arrangement of these tasks to produce the shortest possible path from start to finish?" Or stated another way, "What tasks can be done in parallel?"

To create a fast system, the relationship between each task must be carefully examined. What task(s) is required to be completed before this task can be completed? What other task is dependent upon completion of this task? For example, the team must review the new documents before they

are signed. Add "responsibility" to each task and put circles around each activity/responsibility. Next, take every task involved and carefully examine each relationship. This systematic approach will put tasks together into a process. It is a picture worth a thousand words. See Fig. 7.5.

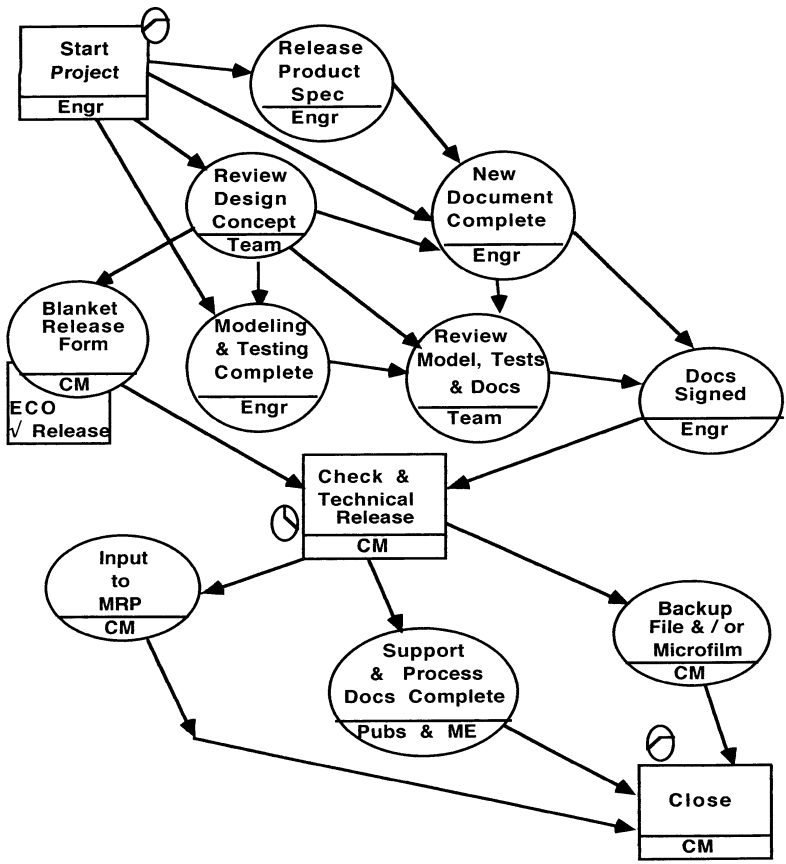

Figure 7.5. Release process flow.

Notice that responsibility is always singular. The Cognizant Engineer can't do the team review, but he or she is responsible to assure that it occurs. CM might be chartered to call the team meetings, to keep action items, etc., but this doesn't take away the responsibility of the Cognizant Engineer.

The point of origination of the release form is noted. To clarify, a few notes may be added. Too many notes, however, is an indication that standards are needed. The titles of the task are traceable to the task list. We could have numbered the tasks and shown the numbers on the flow diagram.

Rule: Do not write procedures to describe a system. Make a work flow diagram and put the flow diagram and task list into a standard.

Reason: Although it can be done, the description of relationships is difficult and confusing when in Description form. Parallel relationships are particularly hard to describe. The work flow "picture" is also a better training tool.

This is now a releaseprocess. All of the required tasks are in their proper relationship and documented into a standard(s).

The tiny "clocks" on the rectangular activities are those events that we will measure process time between.

Measure the Process Time

Measurement, in and of itself, tends to improve performance. Don't try to measure every point in the process. This is a common mistake. It yields so much data that it is difficult to pick out what is important.

Rule: Measure the Release Process time in meaningful pieces, and report the results to the top management.

Reason: The project goal was to beat the competition to the market. Tracking release time will allow future projects to learn even better ways to handle the release. This will yield a constant improvement program.

The key points in this process are flagged with a small "clock." There are three clocks dividing the process into two parts. Each measured point in the process needs to be described in the task list or in the standard.

Visibility

Measurement of the release process time will be most effective if the results are made very visible. Report cards do tend to improve kids performance. Sending the report card home to Mom is putting visibility on the results.

All the dates can be kept in a log. A more visible method is to log all the dates on each release form. Put the log into a PC spread sheet. Each week or month a chart or graph can be prepared to show project management and top management how long the major portions take.

For example:

March Releases – Qty 6

Average Work Days

	Project Start to Tech Release	Tech Release to Close
FEL-100	38	4
FEL-200	29	3

Comparisons can be made against historical averages for that type of product. Benchmark the performance with other companies in your kind of business. Post the results and goals in prominent locations. Send them to the top management. Review them with your people. Make CM the source of reliable release reporting.

This writer is not alone in believing that the process time is very important. R. D. Garwood stated in a white paper—"The single Most Important Factor in Determining a Products Profitability is Time To Market!" The fast release process is such an important company strategy that:

Golden Rule: The Time To Release Is Critical To Profitability.