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VTrans Structures Plan Generation Manual

By the VTrans Structures Section

Sixth Edition

VTrans Plan Generation Manual

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Structures Section

VTrans Program Development Division

1 National Life Drive | Montpelier, VT 05633

Phone (802) 828-2621 | www.aot.state.vt.us

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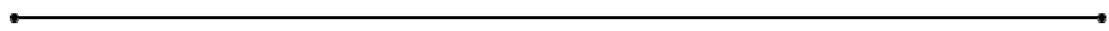
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Introduction

This manual was written as a guide for use by design personnel working in or for the Vermont Agency of Transportation Structures Section. The designer shall use the procedures and standards in the manual in designing all new and rehabilitated bridges. This manual focuses on preparing plans, other Structures Section Manuals cover design and administration. The main purpose of this manual is to provide guidance to generate standardized project plan sets that meet Agency Standards and Structures Section Standards.

This manual covers the plan generation responsibilities of the Section. It does not cover other functions that are a part of the Structures Section responsibilities. Excluded functions include bridge inventory and inspection, administrative supervision, the use of computers for structures design, and personnel policies and procedures.

This manual outlines the process from project conceptual plans through the final plan functions performed by the Section. The Section actively participates in the step system that the Agency has adopted. Each Section describes a particular step and the duties of the designer in completing that step. To further assist the designer, this Manual is organized in chronological order. These Sections describe plan set content to be included in each particular step of the project. [Appendix A](#) lists plan set content items by sheet, and summarizes the step in which the content is to be included in the plan set. Appendix A also contains **Example Plan Set sheets** to aid in defining the content on each sheet and standard practices for these sheets.

Agency Project Managers are responsible for insuring that Agency Standards and Procedures are followed. The Standards and procedures described in this manual fall under Project Managers oversight.

Variations from this manual will be necessary for special or unusual conditions, or between the issuances of new or revised manuals. Consequently, instructions in this document are not intended to preclude the exercise of initiative and judgment in reaction to project specific conditions. Initiative and judgment is encouraged when it is appropriate and there is a rational basis for deviation. However, it is equally important that there be consistency in the application of this manual. The objective is uniformity of process and data integrity for interoperability.

Each Agency PPMS Tracked project has standard project folder locations generated for storage of project digital information. There are standards that the Agency as a whole follows, there are Division Standard (Project Development), then Section Standards and Procedures. This manual will cover Plan Generation Standards and Procedure for the Structures Section, of The Vermont Agency of Transportation, Project Development Division in [Appendix B](#).



SECTION 1: CONCEPTUAL PLANS

1.1 ENGINEERING FOR CONCEPTUAL PLANS

The purpose of Conceptual Plans is to provide enough information to allow the town and any other reviewing agencies to have a reasonable idea of the project without providing specific details.

1.2 CONCEPTUAL PLANS

The Structures Section develops Conceptual Plans to portray the proposed concept of a bridge project. If something is required to make this concept clear, it should be on the plans. If it is not required, it need not be shown on the plans. This manual provides the following lists of items to assist with the development of plans that are consistent. Projects differ; therefore certain items may not be necessary on some projects. The sheet contents will change at each step of the project's development. Each section in this manual will address the changes or additions necessary for each step.

For projects designed by consulting firms, the company's name must be shown on each sheet, in a box near the title block.

Project sheets shall appear in the same order as listed below. [See Appendix A](#) for a list of content to be provided on each sheet during this phase of the project.

1.2.1 Title Sheet

A list of content to be included on the title sheet is provided in Appendix A of this manual

- Plan View
- Project information
- Location map
- Title Block

Use the Agency Standard Title Sheet border and title block. The title sheet is provided on the Agency [CADD web site](#) and in Agency internal network folders.

1.2.2 Index Sheet

Shall be a separate sheet or included on the Preliminary Information Sheet. The index should not be located on the Title Sheet.

- The PI Sheet Builder includes a Plan Sheet Index generator as well as a Standard Sheet Index generator. The tools will help to keep index sheet numbering correct and will provide a current list of approved construction standards with the approved date.

1.2.3 Preliminary Information Sheet

1.2.3.1.1 Design Criteria

Use the current standard PI Sheet Builder – Excel workbook. This workbook file includes all standard requirements for the PI sheet and instruction are provided within the workbook. This file can be downloaded from the [Agency CADD Help](#) web site or is available on internal standard network storage locations.

1.2.4 Conventional Symbology Legend Sheet

The Symbology Legend Sheet has been generated to aid plan set readers. This legend sheet may be added to plans. When using the Legend Sheet the corner title block should match the standard title block used on all the other sheets.

1.2.5 Typical Section Sheet

1.2.5.1 Typical Bridge Section [As applicable for type of superstructure]

- See Appendix A

1.2.5.2 Typical Roadway Section

- The Material Tolerances table (Figure 1.2) shall be shown on the Typical Section Sheet with the Typical Roadway Section.
- See Appendix A for addition Typical Section Sheet requirements.

Figure 1.2 -- Material Tolerances

MATERIAL TOLERANCES (IF USED ON PROJECT)	
SURFACE	
- PAVEMENT (TOTAL THICKNESS)	+/- 1/4"
- AGGREGATE SURFACE COURSE	+/- 1/2"
SUBBASE	+/- 1"
SAND BORROWS	+/- 1"

1.2.6 Layout Sheet

The project Layout Plan Sheet(s) is the plan layout view of the project. Standard project plan sheets are generally setup to plot at 1"=20' scale. There are several plan sheet types generated for each project. There are always mainline plan Layout Sheets showing new and proposed roadway construction features. See Appendix A for a list of content.

It is important to setup the plan layout for sheeting early in the project and maintain the layout location and matchline placement for the duration of the project. The layout and matchline placement will be reused for several different types of plan layout sheets as the project progresses.

1.2.7 Profile Sheet

The profile sheet will show the proposed mainline vertical geometry and the existing ground surface along the proposed geometry from begin approach to end approach. Profile is drawn at a 2 time vertical exaggeration, (1"=20' scale horizontal & 1"=10' scale vertical).

1.2.8 Roadway Cross Sections

Roadway Cross Sections for the project mainline and side roads are provided. The cross sections show only the proposed backbone from begin project to end project and existing ground. Roadway cross sections are cut at a 50 foot intervals or closer, with no vertical exaggeration, at 1"=10' scale.

1.2.9 Channel Cross Sections

Channel Cross Sections showing existing ground, cut along the channel geometry. These sections should be cut at a minimum of 25 foot interval and 10 foot between wingwalls. Channel sections are generally drawn at 1"=10' scale.

1.2.10 Resource Site Plan

The Resource Site Sheets are provided for the Conceptual plan set submission to help identify resource conflicts. Resources may include such things as wetlands, habitat areas, agricultural areas, historic or potential historic features or areas, archeological areas or other resources identified by the agency resources section. The Resource Site Plan sheets are used by the resource section in the process to obtain or clearing resource permits.

The Resource Layout sheet shall be renamed and used as the EPSC Existing Site Plan after the Conceptual Plans have been completed and Preliminary Plan design begins. The same resources will be shown in the EPSC Existing Site plans as were shown in the Resource Site Plan.

SECTION 2: PRELIMINARY PLANS

2.1 ENGINEERING FOR PRELIMINARY PLANS

The purpose of preliminary plans is to refine the project scope based on the information from the Town, the public and other agencies and divisions within the VAOT. Preliminary plans should contain the final scope of the project. Upon approval, a final design could effectively be completed.

2.2 PRELIMINARY PLAN CONTENTS

Before making a Preliminary Plan submittal, the plans must meet the following content criteria: If a previous designer has already created a sheet for conceptual plans, the required information below includes modifications or additions to that sheet.

The plan sheets shall appear in the same order as listed below. [See Appendix A](#) for plan sheet content completed prior to Preliminary Plans and to be added for Preliminary Plans.

2.2.1 Title Sheet

The title sheet should be nearly completed before preliminary plans.

2.2.2 Index Sheet

Index of sheet should be updated to show all sheets to be included in the preliminary plan submittal. Index sheet title should match the sheet title shown in the sheet corner card.

2.2.3 Preliminary Information Sheet

2.2.3.1 Final Hydraulics Report

The final hydraulics report when completed will be imported into the (PI) Project Information Sheet.

2.2.3.2 Design Criteria

- Fill remaining data as applicable
- If using piling, show average pile length rounded to the next 5 foot increment for each substructure unit [use the word average for each length shown]

2.2.3.3 Traffic Maintenance

Fill in remaining blanks

2.2.3.4 Traffic Data Table

Place data if not done at a previous step

2.2.3.5 Temporary Bridge Sketch

Schematic showing the horizontal and vertical requirements for size of opening. This is built into the Preliminary Information Sheet and must be filled out accordingly.

2.2.3.6 Structural Detail Sheets

Structural Detail Sheets or SD sheets are provided by the Structures section and available on the Agency [CADD Help web](#) site. The SD sheets shall be indexed separately from the main project plan sheets, but will be included in the plan set following the plan sheets and before the Standard Sheets. The PI Sheet Builder does not currently automate the SD sheet index.

2.2.4 Typical Section Sheets

2.2.4.1 Typical Bridge Section

The Bridge Typical should be nearly completed for the preliminary plan submittal. All major components of the bridge cross section should be defined for this submittal.

2.2.4.2 Typical Roadway Section

Show clear zones (if not already shown). All major components of the Roadway Typical should be defined for this submittal.

2.2.4.3 Typical Abutment Earthwork Section

The Typical Earthwork Section should be inserted. There are several CAD cells available to use for this typical with only minor revisions required for most projects. This typical should not specify bridge structural components. This section is intended to specify excavation type and limits as well as note fill type requirements.

2.2.4.4 Typical Channel Section

This section will show channel excavation type and limits as well as proposed typical stone fill requirements. Channel typical CAD cells are available that should require minimal modifications.

2.2.5 Tie Sheet

If the project has survey done by the Agency Route Survey Section the content of the tie sheet is completed by the Agency Survey Section. [See Appendix A](#) for Tie Sheet plan content. If the survey is provided by outside consultant survey the consultant should provide the Tie Sheet.

2.2.5.1 Upper Section—Geodetic Control Information [if provided.]

- GPS control point name
- Northing and Easting coordinates and elevation
- Description of point location
- Swing ties to point if provided (field measured not scaled off drawings if no swing ties are field measured then non are shown on the Tie Sheet).

2.2.5.2 Middle Section—Traverse Tie Information

- Swing ties shown in individual boxes with proper orientation but not necessarily to scale
- Topo and tie distances (field measured, not scaled off drawings if no ties are field measured then non are shown on the Tie Sheet).
- Description of a point
- Northing and Easting coordinates and elevation

2.2.5.3 Lower Section—New Alignment Tie Information

- Swing ties shown in individual boxes with proper orientation but not necessarily to scale
- Topo and tie distances (field measured not scaled off drawings if no ties are field measured then non are shown on the Tie Sheet).
- Description of a point in station
- Northing and Easting coordinates
- Not necessary to have these ties before proceeding to next step

2.2.5.4 Horizontal and Vertical Datum

2.2.6 Plan Layout Sheet

The Plan Layout Sheet(s) should be well along prior to preliminary plans. The layout borders and matchlines should already be set. These sheets should show all new roadway features such as edge of pavement, guardrail, sidewalks, as well as bridge and culverts. The proposed mainline horizontal geometry is also shown, including horizontal curve data, cardinal and regular stations. Side line geometry such as minor side roads, drives, or walks may only show regular stations, geometry reports can be provided in the plans for layout purposes.

All proposed Limits of construction including toe of slope limits, temporary limits, should be set during the this plan phase. All proposed drainage should be shown and labeled in the Play Layout Sheet.

On smaller projects drainage and utility information may be shown in the Plan Layout Sheet only. If space on the sheet(s) is limited, drainage and utility information may be broken out into their respective sheets i.e. Drainage Layout Sheet or Utility Layout Sheet.

2.2.7 Profile Sheet

2.2.7.1 Profile

The project Begin Approach and End Approach stations should be established. The proposed Profile will have additional information added pertaining to the bridge abutments. The roadway cross slope Banking Diagram can also be added to the profile at this point.

2.2.8 Traffic Control Sheets

Traffic and Safety has provided many details for traffic control during construction. The designer may consult these for assistance in developing traffic control for a project. Also use the Manual on Uniform Traffic Control Devices (MUTCD) provided by FHWA.

2.2.9 Boring Information Sheet

Include information if available. Although this Step may continue without boring information.

- Layout – This should include existing topo around the area of the borings and mainline geometry regular stations. All borings should be numbered and labeled to match the boring logs.
- Boring Chart – The chart will include the boring number as well as station offset and/or northing easting of each boring location.
- Boring Log Sheet – Boring logs for each boring will be included. For borings located in the vicinity of proposed structures the proposed footing or pile tip and pile cap elevations should be annotated.

2.2.10 Plan & Elevation

The Plan and Elevation sheet is essentially the start of the Bridge specific drawings and details within the project plan set. It will provide in greater detail bridge layout information including substructure (footing, pile cap, abutment, and wingwalls) as well as superstructure. Additionally the plan sheet will show Bridge Rail, Approach Rail and its location relative to the bridge. This sheet will show pay limits for Bridge rail, start of Approach rail, and start of standard roadway rail if applicable and if fits in the limits of the drawing.

2.2.10.1 Plan View

Plan sheet topographic features such as rail post, pavement edges, shoulder edge, stone fill areas, superstructure and substructure outlines are elements in the project New and Proposed (NU) design file. These are proposed features, they are drawn in the project NU design file and referenced into other plan sheets. Annotation of the Plan View are located in the Plan and Elevation (PE) design file, the Plan View is an enlarged and annotated view of features drawn else where. Only above ground elements are shown in the elevation view. Footings, stone fill keyways and other underground features are omitted.

2.2.10.2 Elevation View

Typically the Plan and elevation are shown on the same sheet one under the other. There may be projects where the Elevation View is omitted. The elevation view provides the only full visual profile representation of the Bridge.

The Elevation View is a non vertically exaggerated profile view with bridge specific components drawn and annotated in the elevation graphic area, with key elevation constraints annotated.

2.2.11 Roadway Cross Sections

Cross Sections may already be cut during the conceptual plan phase. If possible use the same cross sections and add in and update the cross sections for the preliminary phase. It may be necessary to regenerate cross sections. There may be additional cross sections needed within the set or the old set may not provide space or setup needed to add in all new design elements.

2.2.11.1 Cross Sections

Cross sections should be provided for mainline geometry and sideline geometry. Drives may also require cross sections if there is a significant amount of earthwork and grading proposed.

2.2.11.2 Material Transition Details

The material Transition Details may be included in the cross section sheets at the end of the cross section sets. Otherwise a separate sheet may be required.

2.2.11.3 Banking Diagram Transition Details

Banking Diagrams may be included in the Profile Sheet if space permits. Otherwise a separate sheet may be required.

2.2.12 Drive & Culvert Cross Section Sheet[s]

Drives may also require cross sections if there is a significant amount of earthwork and grading proposed. Culverts may also require cross sections cut from the road geometry parallel to the culvert. This will clearly show culvert inverts and culvert slope as well inlet and outlet grades.

2.2.13 Channel Cross Sections

Channel Cross Sections from the conceptual state will only show existing ground. The Abutments and other channel work as well as proposed project information can now be added. Ordinary High Water OHW can be shown if known.

2.2.14 Erosion Prevention and Sediment Control Sheets

Refer to the "[Designer Erosion Prevention and Sediment Control Checklist](#)" for detailed information on what needs to be included in these sheets. The sheets listed below are a brief summary of content and intent of the EPSC Site Plan sheets. The EPSC Site Plan sheet shown below are a brief summary of the content required. If the [Checklist](#) and guidance referenced above allows for a simplified EPSC Site Plan follow that guidance. Low impact project may require only one EPSC Site Plan.

The legend for the EPSC Site Plan sheets, will be, one combined standardized legend shown on the EPSC detail sheet.

2.2.15 Existing EPSC Site Plan

The existing conditions EPSC Site Plan will include existing survey topographic features with annotations. The existing ground contours will be shown for surveyed area. Proposed mainline and sideline stationing will also be shown as well as begin and end project locations.

2.2.16 Construction EPSC Site Plan

Show Project Demarcation Fence (PDF) or Barrier Fence, as required. Generally this is located five to ten feet outside the silt fence boundaries, to demarcate the area that the contractor may have access to with equipment. Where silt fence is not being used the PDF should be located five to ten feet beyond the cut/fill limits. If there are archaeologically sensitive areas or class II wetlands, which must be protected with Barrier Fence, then the PDF may be omitted. The area inside the PDF is the "disturbed area" reported to the environmental section for consideration in permit applications. PDF should not cross driveways, rivers, or other public access areas. The original ground contours should not be shown inside the limits of proposed construction.

2.2.17 Final EPSC Site Plan

Final Condition EPSC Site Plan will provide a view of the proposed site after construction is complete. Erosion control and preventative materials and methods will be shown and specified for the after construction site. Erosion control and preventative materials and methods used only during the construction phase such as PDF and Silt Fence can be removed. The original ground contours should not be shown inside the limits of proposed construction. Proposed contours if available can be shown inside the limits of construction.

2.2.18 EPSC Details Sheet

The Details Sheets contain details provided by the agency and referenced into drawings. All the details are provided on the [Agency CAD web site](#) and internal network folder locations. The EPSC Legend CAD cell can also be shown on the first EPSC Details sheet.

SECTION 3: FINAL PLANS

3.1 ENGINEERING FOR FINAL PLANS

The purpose of Final Plans is to provide a complete set of construction ready plans. The plans will provided all the required plan set content including the Structural Detail Sheets. The Agency Construction Standard Sheets will be listed on the Index sheet but not included in the set.

3.2 FINAL PLAN CONTENTS

The Project Manager will organize and implement project conformance to the Structures QC/QA Program. Structures QC/QA Program is located on the Agency Web site, [Program Development Division, Structures Section](#).

[See Appendix A](#) for a list of content to be provided on each sheet during this phase of the project.

3.2.1 Title Sheet

Title Sheet should only require minor updating during this phase of the project. Any designer notes, may be deleted. Verify that the correct Standard Specifications For Construction date is referenced in the notes near the Title Block.

3.2.2 Preliminary Information Sheet

- Update the Sheet Index as needed and add the Structures Detail Sheets as well as Agency Construction Standard Sheets.
- Make any modifications to the design criteria if needed.
- Add Load Rating information to table.

3.2.3 Typical Section Sheets

The Typical Sections should have been completed in the previous project phase. The final design and detailing of the bridge and approach slabs may affect or change the project Typical so they should be verified as the Bridge superstructure and substructure are finalized.

3.2.4 General Notes

This sheet shall include notes for the contractor. Write these notes clearly. Any note requiring a pay item shall include the pay item and it's description.

3.2.5 Bridge and Roadway Quantity Sheet

3.2.5.1 Quantity Breakdown

- Quantities should be broken down and listed on the Quantity Sheet as follows:
 - Superstructure
 - Abutments
 - Approach slabs
 - Piers
 - Channel
 - Roadway
 - Utilities [participating and nonparticipating] Waterline, Sewer line, Street Lighting, Gas line
 - Erosion Control
 - Other categories, as appropriate
- Items
 - List in numerical order
 - Shear Connector—Total Number; e.g., [1322 - 7/8" x 7"]
 - Include Mobilization Item

3.2.5.2 Earthwork Summary

- Fill required
 - Measured area fill [= A]
 - Less factored solid rock excavation [factor is 1.3] [= B]
 - Less displacement of any large buried structures [= C]
 - Net measured area fill [A - B - C = D]
 - 1.15 x net measured area fill = factored fill [1.15 x D = E]
- Measured area material available for fill
 - Earth excavation x 1.0 [= F]
 - Channel excavation 0.3 [= G]
 - Structure excavation or excavation within cofferdams x 0.3 [= H]
 - Total material available for fill [F + G + H = I]
- Borrow or Waste = factored fill less total material available for fill [E - I]

3.2.6 Tie Sheet

The Tie Sheet should have been completed for the Preliminary Design Phase of the project design. If not the Agency Route Survey Section is responsible for generating the Survey Tie Sheet see [Section 2](#) of this Manual for Tie Sheet information

3.2.7 Layout Sheets

Final design phase of the project should require little modifications to the Plan Sheets. Changes made to the Bridge Superstructure or Substructure should be updated on the Plan Sheets as needed. Changes made to any proposed feature should be updated or cross checked with the Plan Sheets including construction notes on the Plan Sheets. Any changes to the limit of construction should be noted, and notification to the Agency Right of Way section may be required.

3.2.8 Profile Sheet

At final design the profile should require little modifications. All Finish Grade elevations noted on the Profile should be verified and updated as required due to possible changes. The substructure and superstructure are engineered and detailed during final design. Changes to profile should be updated as required.

3.2.9 Traffic Control Sheet

Traffic Control Sheet should have been completed for the preliminary plan phase of the project. Update as needed.

3.2.10 Drainage Layout and Details Sheets

Drainage Layout Sheet should have been completed for the preliminary plan phase of the project. Drainage Details may be designed and detailed during this phase of the project.

3.2.11 Boring Sheets

Boring Sheet should have been completed for the preliminary plan phase of the project. Update as needed.

3.2.12 Plan and Elevation Sheet

Plan and Elevation Sheet should have been completed for the preliminary plan phase of the project. The plan and elevation specifically shown the bridge superstructure and substructure and may need to be updated accordingly due to final design and detailing.

3.2.13 Superstructure Details

The following details are generic and are provided for guidance. The designer is responsible for showing all necessary details for each specific project.

- Bridge Typical Section: This can vary depending on the bridge type. This is where deck structural details will be drawn and labeled.
- Deck or Slab Reinforcing
- Concrete Placement Schedule
- Bridge End Detail
- Framing Plan
- Prestressed Superstructure
- Beam/Girder Elevation
- Camber Diagram and Dead Load Deflection
- Diaphragm Details
- Beam Splice Details
- Bearing Device Details
- Beam Haunch and Shear Connector Detail (May be covered on Structures Details Sheets)
- Bridge Joint Details (May be covered on Structures Details Sheets)
- Approach Slab Details

3.2.13.1 CADD Cell Superstructure Details

Various typical superstructure details are available on CADD. Use these cells when appropriate. Structures provides [Structures Detail Sheets \(SD Sheets\)](#) that shall be added to the end of the project to cover common details that are repeatedly used on projects.

3.2.14 Substructure Details

Substructure detail order is shown in [Appendix A](#). The Structure Section has a standard method for numbering Substructure components. Substructure numbering system is based on a point down station looking up station at the Bridge. The first abutment is Abutment 1, the left side wingwall is WW1 the right side wingwall is WW2. The abutment down station from Abutment 1 is Abutment 2, left side wingwall is WW3, right side wingwall is WW4. It is a good idea to make sure the substructure numbering is setup properly prior to detailing. The Structures Design Manual also covers this subject.

3.2.15 Reinforcing Bar Detailing

It is important to annotate and label the rebar corrosion resistance level for each bar shown in the plans and details. Each bar callout must indicate the corrosion resistance level. This level indication will specifically correlate to the **AS BUILT "REBAR" DETAIL** box on the PI sheet. This box shall be filled in during construction and recorded for the as built record plan archives. This box will show the bar TYPE and GRADE of steel used for each rebar corrosion level as defined in the plan structural concrete details.

3.2.16 Reinforcing Steel Schedule

- Avoid detailing bar lengths greater than 40'-0" where practical.
- Denote epoxy coated bars with the Prefix E. Epoxy coated bars are used on rehabilitation project where matching existing bars is necessary.
- Corrosion Resistance Level as defined in the Structures Design Manual is denoted with a .2 for level two suffix or .3 for level three suffix, .1 for level one is to be omitted.
- List bar groups by Corrosion Resistance Level and structural components such as superstructures, abutments, wingwall, pier, approach slabs, etc.

3.2.16.1 List Bars

List bars within a group as follows:

- Straight bars
 - #5 bars
 - #6 bars
 - etc.
- Bent bars
 - #5 bars
 - #6 bars
 - etc.

3.2.16.2 Bar Nomenclature:

- Example 1EA1105
 - 1EA denotes an epoxy coated bar for abutment 1
 - 11 denotes bar size [e.g., #11 bar.]
 - 05 denotes bar identification number [e.g., the fifth #11 bar.]
- Level II-III Example 1A1105.2
 - 1A denotes a bar used in abutment 1
 - 11 denotes bar size [e.g., #11 bar.]
 - 05 denotes bar identification number
 - .2 denotes a Level II Corrosion Resistance Designation
 - 1A1105.3 would make this a Level III Corrosion Resistance bar.
- Other Units:
 - S—deck or slab

- AS—approach slab
- P—pier
- W—wingwall
- B—barrel in R.C. box

3.2.16.3 Non Bar list nomenclature:

On some projects reinforcing steel bar lists and bar schedules may be provided by the fabricator and not provided by VTrans to the Contractor. On these projects reinforcing steel can be called out in standard structural engineering notation per CRSI.

- Examples:
 - #11 @ 12” Level **I** bar type
 - #11 @ 12” EPOXY Level **I** epoxy coated bar
 - #11 @ 12” L2 Level **II** bar type
 - #11 @ 12” L3 Level **III** bar type

If bar schedules are not provided to the Contractor, bar dimensions may need to be provided in the plan set for bent bars and other non standard bar dimensions. However no bar list grouping or number system is required in the structural design plans or details. If the reinforcing steel bar schedule is not provided in the plan set, the contractor and fabricator are responsible for providing fabricator shop drawings with a bar list and bar schedule, along with the fabricator details for review by the project engineer. As noted below Test Bars should be requested in the plan sets, for example in the Project General Notes – Concrete Section.

3.2.16.4 Test Bars

- Provide extra bars for testing. Provide bars for testing in accordance with the [“Vermont Agency Of Transportation Materials Sampling Manual”](#) available on the agency web site.
- Avoid indicating two test bars in a line on schedule if possible. Distribute test bars evenly to get a better test sampling.
- Test bars shall be designated as one additional bar added to the number required for a detailed bar on the reinforcing bar schedule.
- The actual bar used for testing should be randomly selected from those supplied under the detail bar mark.

3.2.17 Roadway Cross Sections

Roadway Cross Sections should have been completed for the preliminary plan phase of the project. Update as needed.

3.2.18 Channel Cross Sections

Channel Cross Sections should have been completed for the preliminary plan phase of the project. Show or update Ordinary High Water OHW when acquired from final Hydraulic report.

3.2.19 EPSC Layout Sheet

Add the Ordinary High Water OHW extent to the EPSC Existing Layout Sheet. This line represents where the OHW would rise to on the plans.

3.2.20 Right-of-Way Sheets [Non-Federal Projects]

For non-Federally funded projects, the Structures Section creates the Right-of-Way plan sheets showing the following:

- Permanent take-line
- Construction easements
- Channel rights [permanent or temporary]
- Slope rights [permanent or temporary]

SECTION 4: CONTRACT PLANS

4.1 PREPARATION FOR CONTRACT PLANS

Contract Plans are plan sets made ready for the Construction Contracting processes. A final review for contract compliance is performed, plans are sent back with a list of changes that may need to be made prior to sending out a Biddable Contract Plan Set for construction.

4.1.1 Plan Index and Sheet Order Standard

The plan sheets shall follow the order shown below. The plan sheet order as shown is coordinated with other sections of the Agency where possible.

<ul style="list-style-type: none"> ▪ Title Sheet (no sheet index on Title Sheet) ▪ Preliminary Information Sheet (with Sheet Index) ▪ Typical Section Sheet(s) ▪ General Notes ▪ Bridge and Roadway Quantity Sheets ▪ Conventional Symbology Legend 	Project General Section
<ul style="list-style-type: none"> ▪ Tie Sheet ▪ Plan Layout Sheet(s) ▪ Profile Sheet(s) ▪ Traffic Control Sheet ▪ Drainage Layout (if required) ▪ Drainage Details (if required) ▪ Utility Layout & Details (if required) ▪ Traffic Signs and Lines Layout ▪ Traffic Sign Summary Sheet ▪ Boring Layout ▪ Boring Logs 	Project Site and Layout Section
<ul style="list-style-type: none"> ▪ Plan and Elevation (Bridge) ▪ Superstructure Details ▪ Substructure Details ▪ Miscellaneous Structural Detail Sheets ▪ Reinforcing Steel Schedule ▪ Bridge Rail Details 	Structural Detail Section
<ul style="list-style-type: none"> ▪ Roadway Cross Sections ▪ Material Transition Detail ▪ Channel Cross Sections 	Cross Sections
<ul style="list-style-type: none"> ▪ Resource Site Plan ▪ EPSC Site Plans (Existing, Construction, Final) ▪ EPSC Detail Sheets ▪ Right of Way Sheets 	Permit and Regulator Plans
<ul style="list-style-type: none"> ▪ Reference Drawings (Existing Record Plans, Consultant subsets etc.) ▪ Structural Detail Sheets ▪ Construction Standards 	Additional References

SECTION 5: APPENDIXES

APPENDIX A: PLAN CONTENT

The following is a compilation of what is expected on a complete set of plans. Refer to this lists for the individual step submittals, corresponding to that step's chapter.

In the Tables below the (3) columns to the right are to designate what phase of the project content is included in the plans set. [C = Conceptual P = Preliminary F = Final] If the content listed on the right for the each sheet type has a corresponding C in right hand column then that plan content is intended to be included in the Conceptual Plan submission. Likewise P shows content intended to be included in the Preliminary Plan submission, F shows content intended to be included in the Final Plan and beyond submissions. A dash (-) indicates the content is not required for that phase or it is intended to be removed after a prior submission has been completed. For a complete set of [Example Sheets click here](#), or individual examples sheets are available throughout Appendix A were applicable..

A.1 TITLE SHEET [-- EXAMPLE: TITLE SHEETS](#)

Plan View

	Conceptual	Preliminary	Final
Existing edges of roads (dashed) with directions to adjacent towns labeled.	C	P	F
Existing Highway/Route names and/or numbers.	C	P	F
Existing edges of river with river name and flow direction.	C	P	F
Existing building outlines.	C	P	F
Existing bridge or structure (dashed).	C	P	F
Proposed centerline with mainline stations only, no subtangents.	C	P	F
Begin and End Project Stations [also include Mile Marker Station (MM = #.####) for State and U.S. Routs, not applicable to Town highways]	C	P	F
Begin and end bridge stations.	C	P	F
North arrow.	C	P	F
Bar scale.	C	P	F
Include Quality Assurance Level	C	P	F
Horizontal & Vertical Datum.	C	P	F
Title Block – Completely fill in.	C	P	F
Reviewer Notes (Basic project notes before general notes have been developed).	C	P	-

Project Information

	Conceptual	Preliminary	Final
Town, County, Route No. (show class if a town highway, and functional classification), Bridge No.	C	P	F

Project Location (same as shown on the Finance & Maintenance Agreement). Label distances to nearest 100 th of a mile.	C	P	F
Project Description (same as shown on the Finance & Maintenance Agreement).	C	P	F
Length of Structure, Length of Roadway, Length of Project.	C	P	F

Location Map

	Conceptual	Preliminary	Final
Large enough to be legible when reduced to half size.	C	P	F
Identifiable features (e.g., State route, or rivers) labeled.	C	P	F
Project location circled and labeled with project name and number.	C	P	F

A.2 INDEXES OF SHEETS INCLUDING STANDARDS & REFERENCE SHEETS

Preliminary Information

	Conceptual	Preliminary	Final
Index of Plan Sheets.	C	P	F
List of Standards.	-	-	F
Hydrologic Data (Hydraulics Report).	-	P	F
Traffic Data.	C	P	F
Traffic Maintenance Notes.	C	P	F
Temporary Bridge Sketch.	-	P	F
Design Values (Design Live Load, Future Pavement & Design Span).	C	P	F
Design Values (Fill in all remaining categories; if using piles, show average pile length rounded to the next 5 foot increment).	-	-	F
Load Rating Table.	-	-	F

Title Block *

	Conceptual	Preliminary	Final
Project Name & Number.	C	P	F
Sheet Name.	C	P	F
File Name (e.g. – s85e037bdr.dgn).	C	P	F
Project Leader, Drawn By & Designed By.	C	P	F
Checked By ('Drawn By' & 'Checked By' cannot be the same person. The 'Checked By' person is whoever has checked the drawings, not the design.)	-	-	F
* This Title Block information should be filled out on all sheets that include a Title Block. Accordingly, this Checklist Table is not included under each sheet			

A.3 TYPICAL SECTION SHEET(S)

[-- EXAMPLE: TYPICAL SECTION SHEETS](#)

Typical Bridge Section

	Conceptual	Preliminary	Final
Thickness of pavement and/or deck and height & width of curbs.	C	P	F
Types and thickness of pavement lifts.	-	P	F
Cross slope information.	C	P	F
Width to curb, face of rail, fascia.	C	P	F
Type of bridge rail, with reference to standard.	C	P	F
Beam spacing and fascia overhangs.	-	P	F
Girder web depth or depth of rolled beams (e.g.W36).	-	P	F
Number, size and type of prestressed members including depth of overlays.	-	P	F
Sheet membrane waterproofing (paved bridge only).	C	P	F
Haunch, chamfers and drip notches.	C	P	F
Typical diaphragms or cross-frames.	-	P	F
Centerline and location of grade.	C	P	F
Scale: 3/8" = 1'-0" preferred, 1/4" = 1'-0" minimum.	C	P	F

Typical Roadway Section

	Conceptual	Preliminary	Final
Thickness of pavements, Subbase and frost-free material.	C	P	F
Type and thickness of pavement lifts.	C	P	F
Cross slope information.	C	P	F
Width of travel lanes and shoulders with and without guardrail.	C	P	F
Type of guardrail with reference to Standard.	C	P	F
Side slope ratios (1:2, 1:3 etc.) and ditch information.	C	P	F
Centerline and location of grade.	C	P	F
Additional details as required (e.g., sidewalks, curbs, under-drain, etc.).	C	P	F
Clear Zone.	C	P	F
Material Tolerances Table (cell).	C	P	F
Scale: 3/8" = 1'-0" preferred, 1/4" = 1'-0" minimum.	C	P	F

A.4 EARTHWORK TYPICAL SECTION SHEET(S)

Typical Abutment Earthwork Section

	Conceptual	Preliminary	Final
Use cell if possible.	-	P	F
Theoretical cofferdam limits.	-	P	F
Cofferdam notes.	-	P	F
Excavation and backfill limits.	-	P	F

Typical Channel Section

	Conceptual	Preliminary	Final
Use cell if possible.	-	P	F
Excavation.	-	P	F
Stone fill. (Label Stone Fill Type and Thickness)	-	P	F
Grubbing material.	-	P	F
Geotextile limits.	-	P	F

A.5 GENERAL NOTES

General Notes

	Conceptual	Preliminary	Final
This sheet shall include notes for the contractor. Write these notes clearly. Any note requiring a pay item shall include the pay item and its description.	-	-	F

A.6 BRIDGE AND ROADWAY QUANTITY SHEET

[-- EXAMPLE: QUANTITY SHEETS](#)

Bridge and Roadway Quantity Sheet

	Conceptual	Preliminary	Final
Earth Work Summary in Detailed Summary of Quantities	-	-	F
Concrete Pavement breakdown in Detailed Summary of Quantities	-	-	F
Final Estimate Entered into Estimator Application and exported to Plan Quantity Sheet for inclusion in Plan set.	-	-	F

A.7 CONVENTIONAL SYMBOLOGY LEGEND SHEET

[-- EXAMPLE: LEGEND](#)

Conventional Symbology Legend Sheet

	Conceptual	Preliminary	Final
Conventional Symbology Legend Sheet	C	P	F

A.8 TIE SHEET

[-- EXAMPLE: TIE SHEET](#)

Survey Tie Sheet

	Conceptual	Preliminary	Final
Reference Survey's ----- tie.dgn file to setup sheet.	-	P	F
Provide Survey with Alignment Data for placement in bottom 3 rd of sheet (update as necessary).	-	-	F

A.9 LAYOUT SHEET

[-- EXAMPLE: LAYOUT SHEETS](#)

Bench Marks

	Conceptual	Preliminary	Final
Label each benchmark with number, description, and elevation in individual boxes.	C	P	F
Horizontal and Vertical Control points with Traverse point labeled as on Tie sheet.	C	P	F

Existing Topography

	Conceptual	Preliminary	Final
Label all features used for control ties and only critical features near project area (i.e., existing structures, edge of woods, fence lines, guard rail, stone walls, power/telephone poles with numbers, existing drainage and water courses with the name and a direction-of-flow arrow.).	C	P	F
Direction arrows to nearest town or route.	C	P	F
Existing Highway/Route names and/or numbers.	C	P	F

Proposed Mainline Alignment

	Conceptual	Preliminary	Final
Regular and cardinal stations.	C	P	F
Face of guard rail, guard rail flares and shoulder break lines from beginning to end of project.	C	P	F
Curve data (if applicable).	C	P	F

Shown and Label Begin and End Bridge Stations	C	P	F
Begin / End project stations	C	P	F
Begin / End approach stations	C	P	F

Proposed Channel Alignment

	Conceptual	Preliminary	Final
Regular and cardinal stations.	C	P	F
Mainline /channel line intersection labeled with stations and delta angles (delta angle to bridge major cord if applicable).	C	P	F

Other Plan Layout Sheet Requirements

	Conceptual	Preliminary	Final
Existing Bridge Data, Year Constructed, Span, Bridge Type, Clearance etc	C	P	F
North Arrow.	C	P	F
Bar Scale, graphical bar scale and annotated scale (SCALE = 1"=20') shall be provided on each layout sheet. This is the full size plan set plotted scale.	C	P	F
Temporary Bridge Centerline (only when necessary).	C	P	F
Additional proposed critical features.	-	P	F
Existing ROW lines.	C	P	F
Construction item notes (i.e. bridge rails, guard rails, drives, etc.).	-	P	F
New drainage complete with labels.	-	P	F
Drive and side road radii.	-	P	F
Approximate centerline of a temporary bridge detour with related construction limits.	C	P	F
Project conceptual construction limits. (label as Conceptual)	C	-	-
Project construction limits.	-	P	F
Stone fill and related channel work.	-	P	F
The outline of new structure including deck, approach slabs, wingwalls and face of abutments (do not show footings).	C	P	F
Clear zones.	-	P	F

A.10 PROFILE SHEET -- [EXAMPLE: PROFILE SHEETS](#) -- [EXAMPLE: BANKING DIAGRAM DETAILS](#)

Profile Sheet

	Conceptual	Preliminary	Final
Existing ground along proposed line (dashed and labeled).	C	P	F
Proposed vertical alignment.	C	P	F
Vertical and cardinal stations and elevations.	C	P	F
Tangent grades [to 4 decimal places].	C	P	F

Vertical curve information (showing length, stopping sight distance and k values) for sag and crest curves.	C	P	F
Begin/end project stations.	C	P	F
Begin/end bridge stations and finished grades.	C	P	F
Begin and end approach stations.	-	P	F
Lines showing back of abutments and bottom of the superstructure.	C	P	F
Conceptual Substructure (label as Conceptual)	C	-	-
Abutments, including footings with bottom of footing elevations.	-	P	F
Approach slabs.	-	P	F
Existing ground elevations at left of vertical grid lines to 1 decimal place.	C	P	F
Proposed finish grade elevations at right of vertical grid lines to 2 decimal places.	C	P	F
Do not show material transitions.	-	-	-
Do not show Stone Fill.	-	-	-
Scale use 2 to 1 vertical exaggeration, 20-scale horizontal and 10-scale vertical. Label scales but no graphical scale bars needed.	C	P	F
Banking diagram (may be shown here or with Roadway Cross Sections).	-	P	F

A.11 TRAFFIC CONTROL SHEETS

Traffic Control Sheets

	Conceptual	Preliminary	Final
Layout of project	-	P	F
General plan of temporary traffic patterns	-	P	F
If there will be a detour, clearly show this detour on the plan.	-	P	F
If there will be a phased traffic pattern in a bridge rehabilitation project, detail these phases on the plan. Also provide cross sections detailing the expected phases on the bridge.	-	P	F

A.12 DRAINAGE LAYOUT

Drainage Layout

	Conceptual	Preliminary	Final
Drainage Features Layout (if the plan layout sheet is overcrowded)	-	P	F

A.13 DRAINAGE DETAILS

Drainage Details

	Conceptual	Preliminary	Final
Drainage Detail drawings (as required)	-	-	F

A.14 UTILITY LAYOUT**Utility Layout**

	Conceptual	Preliminary	Final
Utility Layout (if the plan layout sheet is overcrowded)	-	P	F

A.15 TRAFFIC SIGN & LINE LAYOUT**Traffic Sign & Line Layout**

	Conceptual	Preliminary	Final
Show plan view of project with basic roadway features	-	P	F
Show and label existing sign to be removed, salvaged, or relocated	-	-	F
Show and Label new signs	-	-	F
Show Existing and New lines (Lane lines, Center Lines, Stop bars) and label if not shown on the plan layout sheet.	-	-	F
Traffic Sign Summary (Use separate sheet as needed)	-	-	F

A.16 BORING INFORMATION SHEET[-- EXAMPLE: BORING INFORMATION SHEET](#)**Boring Layout**

	Conceptual	Preliminary	Final
Existing edges of road and structure (dashed).	-	P	F
A new centerline with regular stations.	-	P	F
North arrow.	-	P	F
Stream name with flow direction.	-	P	F
New bridge abutments outlined.	-	P	F
Location of bore holes marked with appropriate nomenclature.	-	P	F
Bore holes numbered.	-	P	F
Title and scale.	-	P	F

Boring Chart

	Conceptual	Preliminary	Final
Boring numbers.	-	P	F
Station.	-	P	F
Offset from the centerline.	-	P	F
Elevation of bedrock if applicable.	-	P	F

Boring Logs

-- [Example: Boring Log Sheet](#)

	Conceptual	Preliminary	Final
Place logs beside one another without regard to vertical elevation.	-	P	F
Bottom of footing elevation applicable to each log.	-	P	F
Estimated pile tip elevation if applicable.	-	P	F

A.17 PLAN & ELEVATION

-- [EXAMPLE: PLAN & ELEVATION SHEET](#)

Plan View

	Conceptual	Preliminary	Final
Preferred scale is 1" = 10'-0"	-	P	F
Wingwall numbers but no lengths or angles: Each Wingwall WW1 etc.	-	P	F
Abutment askew angles: Askew as defined in the Structures manual.	-	P	F
Bridge Major chord: (if applicable).	-	P	F
Begin and end bridge stations, the centerline of bearing stations: where applicable, and finish grades at each	-	P	F
Limits and type(s) of Stone Fill	-	P	F
All slope ratios (roadway and channel): Label side slopes (e.g. 1:2).	-	P	F
Guard rail with flares [if within limits of drawings] and only first post off bridge	-	P	F
First bridge rail post at each end of bridge [with distance to the end of the bridge. If the layout detail does not show distances, refer to sheet where they may be found]	-	P	F
Edge of shoulders (and pavement if applicable)	-	P	F
Label stream name and show direction of flow	-	P	F
Point of minimum clearance if dry crossing [road or railroad].	-	P	F
Mainline, channel line and sideline(s) with stations	-	P	F
Equated stations at intersection points with delta angles	-	P	F
Substructure outlines with footings	-	P	F
Cardinal stations (i.e., PC, PT, etc.) in area of bridge	-	P	F
Any adjacent drainage or remaining landmarks in area of bridge	-	P	F
The plan need not show curve data	-	P	F
Title and bar scale	-	P	F
North Arrow	-	P	F

Elevation

	Conceptual	Preliminary	Final
Drawn as if looking upstream from the downstream side.	-	P	F
Existing ground and approximate bedrock (if applicable) shown and labeled	-	P	F
Do not show below ground information (i.e., dashed footing, bottom of the stone fill, etc.)	-	P	F
Do not show roadway percent grades or vertical curve information	-	P	F
Do not show girder or beam information	-	P	F
Fixed or expansion ends if applicable	-	P	F
Span length(s)	-	P	F
Guard rail schedule(s)	-	P	F
Design "Q" or the highest "Q" that will pass under the structure	-	P	F
New Stone Fill labeled with the type and thickness (shown just down to existing ground)	-	P	F
New bridge rail and the length of it for each side (if the view does not show length, refer to sheet where it may be found)	-	P	F
The first guard rail post off each corner	-	P	F
Approach rail (may be partially shown)	-	P	F
Left & Right Side Elevation Axes line with Elevation Ticks & Labels	-	P	F

A.18 STRUCTURAL DETAIL SET -- EXAMPLES

-- [Example: Structural Detail Set](#) - Two Span Bridge, Steel Truss and a curved concrete deck with straight Rolled Beam Girders, Finger Joint Details, Pier Details, Curved Wingwall, Bridge and Walkway Lighting Details.

-- [Example: Structural Detail Set](#) – Single Simple Span Concrete Deck on Plate Girders, with one Integral Abutment and one standard spread footing abutment.

-- [Example: Structural Detail Set](#) – Simple Span Standard Abutments on Piles.

A.19 SUPERSTRUCTURE DETAILS

The following details are generic and are provided for guidance. The designer is responsible for showing all necessary details for each specific project.

A.19.1 Bridge Structural Typical Sections

Bridge Structural Typical Sections:

	Conceptual	Preliminary	Final
Drawn no smaller than 3/8"=1'-0" scale, 1/2 scale preferred	-	-	F
Show bridge structural members (Girders, Beam, etc.) label depth and basic size information.	-	-	F
Show concrete deck (if applicable) show reinforcing and deck thickness	-	-	F
Haunch and label min. haunch	-	-	F
Show fascia and fascia depth or call out detail	-	-	F
Curb and curb Reinforcing	-	-	F
Bridge Deck width, overhang width and general cross section dimensions	-	-	F
Shown Bridge Rail, label type and refer to standard if applicable	-	-	F
Label finish grade location and Center Line geometry	-	-	F
Travel way width, shoulder width, curb width etc.	-	-	F
Typical cross slope.	-	-	F
Pavement thickness if applicable	-	-	F
Section title	-	-	F
Annotate scale [SCALE: 1/2"=1'-0"] no graphical scale bar on details	-	-	F

A.19.2 Deck or Slab Reinforcing

Deck or Slab Reinforcing

	Conceptual	Preliminary	Final
Drawn no smaller than ¼"=1'-0"	-	-	F
Begin & End Bridge	-	-	F
All necessary reinforcing details	-	-	F
Annotate scale [SCALE: ¼"=1'-0"] no graphical scale bar on details	-	-	F

A.19.3 Concrete Placement Schedule

Concrete Placement Schedule

	Conceptual	Preliminary	Final
Show desired deck concrete placement segments and sequence for continuous spans, with direction of placement indicated, usually low to high end	-	-	F
List options, if any are available	-	-	F

A.19.4 Bridge End Detail

Bridge End Detail

	Conceptual	Preliminary	Final
Deck reinforcing shown & labeled	-	-	F
Beam, end diaphragm and end haunch steel	-	-	F
Pavement on and off bridge with joint detail [if required]	-	-	F
PVC water stop with all curtain walls [detail curtain wall reinforcing]	-	-	F
Approach Slab Bracket <ul style="list-style-type: none"> ▪ Reinforcing, including dowels to abutment ▪ Thickness of the slab ▪ ½"x6" expansion material under the edge of the slab 	-	-	F
Closed cell foam expansion material at the end of slab, if required	-	-	F
Detail at the interface of abutment top, the back wall base and the curtain wall	-	-	F
Detail the half-section elevation of the curtain wall, parallel to the centerline of bearing. Show the reinforcing configuration in this view.	-	-	F

A.19.5 Framing Plan

Framing Plan

	Conceptual	Preliminary	Final
Centerline bearing at abutments & piers	-	-	F
Beam splice locations	-	-	F
Beam/girder number, size and spacing [normal & skew]	-	-	F
Member size and spacing of diaphragms	-	-	F
Bridge centerline, major chord, and askew angle	-	-	F
Scupper locations	-	-	F
Detail locations for connection details	-	-	F
Drip plate location	-	-	F

A.19.6 Beam/Girder Elevation

Beam / Girder Elevation

	Conceptual	Preliminary	Final
Exaggerated scales [horizontal & vertical]	-	-	F
Sizes of web, flanges, or beams and stiffeners, or connection plates	-	-	F
Centerline bearings & splices	-	-	F
Steel designation	-	-	F
Shear connector details	-	-	F
Charpy V-notch requirements and locations	-	-	F
Girder end details, overhangs	-	-	F
Cover plates with dimensions	-	-	F
Drip plate location [use CADD cell for detail]	-	-	F

A.19.7 Camber Diagram and Dead Load Deflection

Camber Diagram & Dead Load Deflection

	Conceptual	Preliminary	Final
Detailing simple spans with only a note is allowable	-	-	F
Exaggerated scales [horizontal & vertical]	-	-	F
Draw dead load deflection down, camber up	-	-	F
Centerline of bearing at abutments or piers	-	-	F
Numbers of spaces and spacing between ordinates, dimensions between base and curve	-	-	F

A.19.8 Beam Splice Details

Beam Splice Details

	Conceptual	Preliminary	Final
Elevation and Plan Views	-	-	F
All plates with sizes	-	-	F
Bolt spacing	-	-	F
Bolt & hole sizes (hole size if not a standard hole)	-	-	F
Detail filler plates	-	-	F

A.19.9 Bearing Device Details

Bearing Device Details

	Conceptual	Preliminary	Final
Plan View <ul style="list-style-type: none"> ▪ Centerline girders, centerline bearing, skew angle ▪ Beam flange and exposed plate dimensions ▪ Anchor bolt size & hole size in plates [typical hole size is 3/8" greater than the anchor bolt diameter] ▪ Bearing stiffeners ▪ Face of abutment or pier ▪ A temperature setting table ▪ Block out plate if required 	-	-	F
Section normal to beam at the centerline of bearing device <ul style="list-style-type: none"> ▪ Label bearing pad, bolts, welds, and TFE and stainless steel surfaces ▪ Dimension anchor bolt spacing, overall depth of bearing, thread projection, plate thickness 	-	-	F
Section along the centerline of the beam	-	-	F
Show welds, plate thickness [including both ends of any beveled plates], washers, blockout plates and overall depth	-	-	F
Notes and list of design loads, both vertical and horizontal and pertinent notes	-	-	F

A.19.10 Beam Haunch and Shear Connector Detail

Beam Haunch & Shear Connector Detail

	Conceptual	Preliminary	Final
Chamfer beam haunch 1" x 1"	-	-	F
Shear connectors designed as per AASHTO	-	-	F

A.19.11 Bridge Joint Details**Bridge Joint Details**

	Conceptual	Preliminary	Final
Include Vermont Joint Structures Detail Sheets in plan set (if required)	-	-	F
Shear connectors designed as per AASHTO (if required)	-	-	F

A.19.12 Approach Slab Details**Approach Slab Details**

	Conceptual	Preliminary	Final
See Structures Design Manual for assistance in detailing approach slabs	-	-	F

A.19.13 Diaphragm Details**Diaphragm Details**

	Conceptual	Preliminary	Final
Included Structures SD sheet with Diaphragm Details (if require)	-	-	F

A.19.14 Prestressed Superstructure**Prestressed Superstructure**

	Conceptual	Preliminary	Final
Plan view of all members	-	-	F
Detail a specific typical section for the prestressed member indicating: <ul style="list-style-type: none"> ▪ A section showing a strand pattern ▪ Location of the strand pattern on the span. ▪ Geometric dimensions of the section. ▪ Position and spacing of the concrete reinforcement, including size and clearance of bars. 	-	-	F
Elevation view of member indicating: <ul style="list-style-type: none"> ▪ Geometric dimensions ▪ Position of the eccentricity of the strands at the ends of the member, points of tie down, or other locations of change. 	-	-	F
The following information shall be tabulated or noted: <ul style="list-style-type: none"> ▪ Minimum concrete strength $f'c$. ▪ Concrete stress at transfer $f'ci$. ▪ Approximate weight of each unit. ▪ reactions and dead load and SDL. 	-	-	F

<ul style="list-style-type: none"> ▪ Size and grade of prestressing strand used in the design. ▪ Number of prestressing strands used in the design. ▪ Initial prestressing force. ▪ Final prestressing force. ▪ Provide weep holes in bottom of all voids. ▪ See standard cells for longitudinal joint connection details. ▪ If a structural overlay is used, the minimum thickness should be 5". See Structures Design Manual ▪ Method of transverse tensioning 			
Plan view of overlay reinforcing	-	-	F
Appropriate end detail	-	-	F

A.20 SUBSTRUCTURE DETAILS

A.20.1 Detail Order

Detail Order

	Conceptual	Preliminary	Final
Abutments	-	-	F
Wing walls	-	-	F
Piers			

A.20.2 Details

Substructure Details

	Conceptual	Preliminary	Final
Plan views with dimensions	-	-	F
Centerline girders or beams with skews and dimensions	-	-	F
Beginning/End Bridge or centerline bearing with station & finish grades	-	-	F
Footing reinforcing plans	-	-	F
Pile plans [denote battered piles] and size, spacing, and batter	-	-	F
Elevation views	-	-	F
Reinforcing Steel	-	-	F
Weep holes	-	-	F
Elevations—beam seats, construction joint, ends of wingwalls, footings	-	-	F
Typical Sections	-	-	F
Reinforcing bars with splice lengths	-	-	F
Approximate ledge, if applicable	-	-	F
Corner details	-	-	F
Appropriate notes	-	-	F

A.21 OTHER SHEETS OR DETAILS

Other Sheets or Details

	Conceptual	Preliminary	Final
Curb and rail	-	-	F
Bridge railing detail sheets	-	-	F
Mailbox details	-	-	F

A.22 REINFORCING STEEL SCHEDULE

Reinforcing Steel Schedule

	Conceptual	Preliminary	Final
See Section 3 of this manual for Reinforcing Steel Schedule standards and procedures.	-	-	F

A.23 ROADWAY CROSS SECTIONS

[-- EXAMPLE: ROADWAY CROSS SECTIONS](#)

Roadway Cross Sections

	Conceptual	Preliminary	Final
Shown at 50 foot intervals minimum and at critical sections	C	P	F
Existing ground (dashed).	C	P	F
Show only "backbone" of the new surface from begin to end of the project.	C	-	-
Show sides slopes and ditches only on critical sections.	C	-	-
Fully templated with finish grades, side slopes and cross slopes labeled.	-	P	F
Do not show full bridge typical section; show bridge deck outline and F.G. Surface for deck.	-	P	F
Label side slopes & cross slopes at least once per sheet and anytime they change.	-	P	F
Template all material (pavement, subbase, sand borrow, etc.) but don't label them.	-	P	F
Begin/end stations Labels for bridge, project and approaches.	-	P	F
Do not show begin/end stations for materials.	-	P	F
Show invert elevations for all new culverts.	-	P	F
No need to show existing drainage unless the project requires the modification.	-	P	F
Cross reference to appropriate location(s) on Drive & Culvert Cross Section Sheet.	-	P	F

A.24 MATERIAL TRANSITION DETAILS[-- EXAMPLE: MATERIAL TRANSITION DETAILS](#)**Transition Diagram Details**

	Conceptual	Preliminary	Final
If not already shown, include Material Transition Details for both Begin/End Bridge & Begin/End Project.	-	P	F
If not already shown on the Profile Sheet, include Banking Transition Detail.	-	P	F

A.25 DRIVE & CULVERT CROSS SECTION SHEET(S)**Drive & Culvert Cross Section Sheet(s)**

	Conceptual	Preliminary	Final
Use separate sheet(s) at the end of the Roadway Cross Sections	-	P	F
Show drive and culvert section and /or profiles as needed	-	P	F
Cross reference to appropriate location(s) on Roadway Cross Sections	-	P	F

A.26 CHANNEL CROSS SECTIONS[-- EXAMPLE: CHANNEL CROSS SECTIONS](#)**Channel Cross Sections**

	Conceptual	Preliminary	Final
Shown at minimum 25 foot intervals (10 ft between wingwalls)	C	P	F
Existing ground (dashed). Show OHW in sections, when known.	C	P	F
Template with Stone Fill, Granular Backfill for Structures, Unclassified Channel Excavation and Grubbing Material.	-	P	F
Template new substructures with any undercut(s) and piling.	-	P	F
Label the begin/end stations (both sides of the channel) for the following items: Unclassified Channel Excavation Stone Fill Geotextile for Stone Fill Grubbing Material	-	P	F
Template (pattern) bedrock when a substructure is founded directly on the bedrock.	-	P	F
When a channel line cross section intersects a roadway, template only enough of the roadway to clarify any quantities involved.	-	P	F
Do not template any of the superstructure.	-	P	F
Do not show cofferdam limits.	-	P	F
Do not label items on cross sections unless they differ from the typical channel section.	-	P	F

A.27 EROSION CONTROL SHEETS

[-- EXAMPLE: EPSC SITE PLANS](#)

EPSC Existing Site Plan

	Conceptual	Preliminary	Final
Resource Site Plan (After Conceptual Plan can be renamed to EPSC Existing Site Plan)	C	-	-
Refer to the “ Designer Erosion Prevention and Sediment Control Checklist ” for detailed information, below is a basic content listing and guidance.	-	P	F
Show existing contours	-	P	F
Show the location of all resources, i.e. historical, wetland, threatened and endangered species, archeological.	-	P	F
Show existing Right of Way, and property owner names (if known).	-	P	F
Show existing drainage features and flow directions for all waterways and drainage	-	P	F
Show Soils information, obtained from Soil Conservation Service maps, GIS database, or other source.	-	P	F
Show Ordinary High Water OHW line on plan.	-	-	F

EPSC Construction Site Plan

	Conceptual	Preliminary	Final
Refer to the “ Designer Erosion Prevention and Sediment Control Checklist ” for detailed information, below is a basic content listing and guidance.	-	P	F
Show existing contours (outside the construction limits only)	-	P	F
Show the location of all erosion and sediment control measures [e.g., vegetation, dikes, sediment diversions, sediment basins, silt fences, etc.]	-	P	F
Show Project Demarcation or Barrier Fence as required.	-	P	F
Show main line, side line, and channel line major stations (no cardinal stations).	-	P	F
Show proposed edge of pavement and other proposed features.	-	P	F
Show project limits	-	P	F

EPSC Final Site Plan

	Conceptual	Preliminary	Final
Refer to the “ Designer Erosion Prevention and Sediment Control Checklist ” for detailed information, below is a basic content listing and guidance.	-	P	F
Show existing contours (outside the construction limits only)	-	P	F
Show Final contours (inside limits of construction), if available otherwise refer to cross sections for final grade	-	P	F
Show new structures, roadway, shoulder, and other proposed features	-	P	F
Show main line, side line, and channel line major stations (no cardinal stations).	-	P	F
Show the final Right of Way limits.	-	P	F
Show all new drainage features, swales, pipes, ditches, etc.	-	P	F

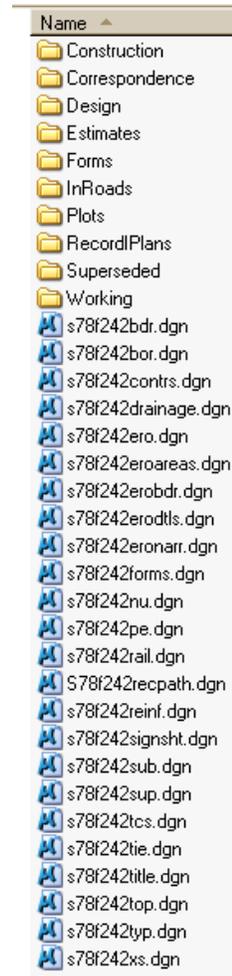
APPENDIX B: PLAN GENERATION DATA FILE STANDARDS

Agency and Project Development Standards for Plan Generation relative to file and folders is defined in the [Vermont Agency of Transportation CADD Standards and Procedure Manual \(VAOT CSPM\)](#). The Structures Section Standards for Plan Generation are defined in this manual.

The Structures Section manages project Design and Plan Generation data as defined here. There are two standard locations for project Design and Plan Generation data. All the material in this manual and relative data that is generated are stored in the PPMS project Folders as defined in the VAOT CSPM. Specifically the Structures Section stores file in the Projects “Structure” folder. Other sections store their files in their respective folders for example survey data is stored in the Projects “Survey” folder. Each section is responsible for defining the folder structure under their sections Project folder. The Structures Section has organizes plan generation data and related data files as defined here.

There are currently 15 design sections. Design section are not necessarily agency sections but project design disciplines. Structures utilizes the “Structures” folder as shown below. All other folders above this level are accessible with a read-only status.

[M:\Projects\](#)



Under the Structures section folder. The folder and file storage structure is standardized for Agency and Section needs. Directly in the Structures folder are all the MicroStation DGN files that are part of the contract plan set or current project state plan set. Under the Structures folder are (10) subfolders containing all project engineering support and data files. This file folder structure greatly simplifies file referencing within and between Structures Section files, and allows other sections within the agency to

easily find current project related design data files, and reference them. All current design drawings are directly in the “Structures” folders everything else is filed away in subfolders. The folder structure inside Structures is also organized as defined below.

This folder structure is organized to help isolate current project design files (plan set data) and make sure all non **Plan Set** design data such as working drawings, calculations, InRoads data, etc. is filed in a folder that helps organize and isolate it. This is also the basic folder structure for other sections within the agency such as the Survey section and Right-Of-Way section. This folder structure facilitates consistent reliable access to project plan set drawings. The drawings that are shared between Agency Sections are always in the Project \ [PPMS] \ [Section] \ folder. And only current valid design file drawings are in this location.

Sub Folder	Description of Standard Use
Construction	Use to store construction related reports and information requested during the project construction process. Examples would be Geometry LandXML reports. Structural Geometry Reports. Details and drawings for Construction related design as needed and all approved or approved as noted shop/fabrication drawings.
Correspondence	This is a folder used for project plan generation specific internal correspondence and communications. A link to the General Agency Project correspondence folder can be added to this folder for quick access .
Design	Design data, excel spread sheets, Structural analyses data, Calculation Sheets Design related reports. etc
Estimates	Estimate information calculations, worksheets, estimator files and estimator exports that are incorporated into the quantity sheets. etc
Forms	Excel forms used in plans and linked into Design files (dgn), Project PI Sheet, Quantity Sheet, Reinforcing Steel Sheet, Table and other forms. etc
InRoads	The Project Proposed Geometry (ALG), Templates, Roadway Definitions, Proposed DTM, are in the InRoads Folder. Subfolders are used to help organize any other InRoads design data files. Working Design Files used for generating and viewing InRoads design data will also be stored as needed in this location but are not directly part of the Project Plan Plot set.
Plots	Iplot Plot Set files and current PDF plan sets as well as project phase plan sets stored and organized in subfolders such a Conceptual Plans, Preliminary Plans, Final Plans, etc.
Record Plans	This is where PDF file of the existing bridge would be stored or other media related to the existing bridge. DPR references and links can be stored here.
Working	This folder contains all other processes not covered in the above shown folders, including Permit, Hearing, Renderings, 3D Modeling, and generally drawings or files not used directly in the Construction Plan set. This is the catch all folder, if not covered in the above folders it goes in this folder.

Folder Structure beyond this level should also be well organized and maintained. An example project folder and file structure is available for download on the [VAOT CADD Help](#) web site in the “CADD Example Project File Data Structure (Structures)” link.