Road & Bridge Design Publications

Monthly Update – June 2013

Revisions for the month of **June** are listed and displayed below. The special detail index for **May** will remain in effect. Contact Wayne Pikka (pikkaw@michigan.gov) for questions related to the road changes. Contact Vladimir Zokvic (zokvicv@michigan.gov) for questions related to the bridge changes.

Road Design Manual

1.02.01C: Project Identification: The use of the CS/JN block on the right-hand margin was eliminated.

1.02.02C: Index: Minor wording changes were made.

1.02.05B: Scale: Revised the scale for typicals.

1.02.05D: Existing typical cross section: Minor wording change.

1.02.06: Miscellaneous Details & 1.02.07: Note Sheet: Eliminated references to other sections.

1.02.12C: Guidelines: Revised the scales for plan and profile sheets for rural projects. Revised sheet orientation and stationing to current practice.

1.02.12D: Quantities: Eliminated the use of quantities on profile sheets.

1.03.01: Order of Plan Sheets: Revised the order of the soil boring sheet and added "drainage-if needed" to the asterisked note.

1.03.02: Lettering, Notes, and Conventions: Replaced "CAD Standards" with "Sample Plans".

1.04.01: Preparing a Log Project: In regards to using a sheet index on a separate page, a sentence describing the limited space on an 8.5" x 11" sheet was eliminated.

Road & Bridge Design Publications

Monthly Update – June 2013

Bridge Design Manual

3.02.02: Updated form title, link and location.

7.01.19 (LFD & LRFD): New section for Accelerated Bridge Construction. This section is used in conjunction with Chapter 6 of the MDOT Scoping Manual.

8.03 AA. (LFD & LRFD): Updated haul route alternate process and responsibilities.

8.05 S. (LFD & LRFD): New requirement for items cast into precast concrete units/elements to be galvanized or epoxy coated.

8.07.01 Z. (LFD & LRFD): New note for integral and semi-integral bridge deck slabs at the backwall. See also Bridge Design Guide 6.20.04.

8.07.04 W. (LFD & LRFD): Removed hot dip galvanizing requirement for items cast into beams. Use with some external item material properties is not always feasible.

Bridge Design Guides

6.20.04: New note for integral and semi-integral bridge deck slabs at the backwall.

Updates to MDOT Cell Library, Bridge Auto Draw Program, etc., may be required in tandem with some of this month's updates. Until such updates to automated tools can be made, it is the designer's/detailer's responsibility to manually incorporate any necessary revisions to notes and plan details to reflect these revisions.

CHAPTER 1

PLAN PREPARATION

1.01

DEVELOPMENT METHODS

1.01.01 (revised 11-28-2011)

References

A. Geometric Design Guides - Design Division

B. Guidelines for Plan Preparation – Design Division

C. ***Michigan Manual of Uniform Traffic Control Devices,*** Current Edition

D. Standard Plans and Special Details – Design Division

E. ***Standard Specifications for Construction,*** Current Edition

Existing plans for a recent project, similar in nature to the proposed project, are an excellent reference.

1.01.02 (revised 11-28-2011)

General

This chapter provides the information and details necessary to prepare a set of plans. The plans should contain all the information essential for bidding and constructing the project. Although innovation and creativity are encouraged in the preparation of plans, the importance of general uniformity must be emphasized. Plans should be adaptable to the diverse requirements of the Design Division and Construction Field Services Division. At the same time the plans should be a functional reference, familiar to the users. A general format should be followed by all Designers.

1.01.03 (revised 10-22-2012)

Survey and Mapping Methods

The choice between a ground survey, an aerial survey, a laser scanning survey, or a combination depends in part on the type and length of project, the information required, and the time schedule.

Some projects may not require a survey or may require only a minor pick up survey. Old plans are valuable sources of information on these projects.

Refer to Chapter 14, Procedures for Plan Preparation, for more information on surveys and mapping.

1.02

PLAN SHEETS

1.02.01 (revised 6-17-2013)

Title Sheet

The location map shown on the title sheet will generally be obtained from either county or city maps which are available in ProjectWise in the Reference Documents. For a particular project, a suitable map or section of one is chosen and incorporated on a standard title sheet cell. Because first impressions often sell the product, the title sheet should be neat in appearance and layout

1.02.01 (continued)

Title Sheet

A. Project Location

The project should be located on the map and the limits (P.O.B. Stationing and P.O.E. Stationing) outlined to clearly show and stand out from the rest of the map. The map should be oriented with north to the top of the sheet and with a north arrow shown near the map.

The map must show the entire project limits and other features that will easily identify the location. Preferably, at least two trunklines, names of major cross roads, and an incorporated city or village, township, and county should be shown on the location map. The town, range and section numbers should also be shown on the map.

The point of beginning and the point of ending should be identified by control section, physical reference, job number, stationing, and control section mileposts. Station equations and stationing of major cross roads should also be shown.

The location map should also show bridge numbers, railroad crossing numbers, and railroad companies within the project limits for both existing and proposed crossings. Detour routes, if applicable, should be shown.

1.02.01 (continued)

B. Traffic Data

Existing year traffic data and projected 20 year traffic data should be located on the upper left part of the title sheet. Pertinent counts including ADT, DHV, percent commercial, and the year taken are shown in tabular form. For freeway projects, the commercial DDHV should also be listed. These counts are usually present counts and projected counts. Counts are obtained from the Bureau of Transportation Planning (see Chapter 14 of this manual).

The design speed and posted speed should also be shown. If the design speed changes within a project, show the various limits by stationing, cross roads, or mile points.

C. Project Identification

The following format should be used for identifying projects:

MICHIGAN DEPARTMENT OF TRANSPORTATION

ROUTE: I- & M-****
CITY OF ***
***** TOWNSHIP**
***** COUNTY**

SECTION	CONTROL SEC	JOB NO.	FEDERAL PROJECT	FEDERAL ITEM
1A	XXXXX	XXXXXXX		
1B (LOG JOB)	XXXXX	XXXXXXX		
2	XXXXX	XXXXXXX		

For filing and reference purposes, both the control section and job numbers should be shown in the appropriate blocks in the bottom margin. If the project has multiple job numbers, show them in the title block. Projects with multiple control sections should show the major control section (as programmed) first with others following in parentheses.

1.02.02 (revised 6-17-2013)

Project Information Sheet

The purpose of the Project Information Sheet is to show, in a convenient location, the Utilities, Notes Applying to Standard Plans, and the Plan Index.

Information on the Project Information Sheet should be project specific, current, and complete.

A. Utilities

The preliminary utility list should be prefaced with and followed by the standard notes that best fit the project.

The preliminary utilities list should be from: a current survey, old plans, or the information retrieval system. It should be updated to the current date. Utility information can also be obtained from the field review section, the utility section, or the Region/TSC Utility/Permit Engineer. The final utility list shall be from the Region/TSC Utility/Permit Engineer.

The list should include the name and address of the utility, the type of utility, and a contact person, listing a phone number and address if available.

B. Notes Applying to Standard Plans

Current standard plans and special details that are applicable to the project are listed on the Project Information Sheet. Special details called for on the note sheet must also be physically attached to the construction plans.

1.02.02 (continued)

Standard plans are engineering drawings showing standard details of various construction items which present the current policies of MDOT and are approved for repetitive use. In order for these drawings to become Standard Plans, they must first be approved by MDOT Administrators and have FHWA approval. The approved drawings are then made available on the MDOT Web site.

During the time these plans are being processed for approval, they are often included in the construction plans as special details.

Even though these plans are labeled "Standard Plan" in the title block, they are still considered special details when included in the construction plans. Do not change the “standard plan” label to “special detail” or remove the plan number and/or plan date on these plans. Special details are also available on the MDOT Web site.

C. Index

The index is always located on the right side of the Project information sheet. Plan sheets should be arranged in the order as shown in Section 1.03.01. The index should show only the sheets included in the project. If bridges are included in the project (package project) they would be indexed "Section 2 - Bridge Plans" under the road sheets which would be referenced "Section 1 - Road Plans".

1.02.05 (revised 6-17-2013)

Typical Cross Sections

Typical cross sections are included in plans to give a graphic display of the existing and proposed cross sections of the roadway. They also describe to the contractor where each typical section will apply. All integral parts of the roadway and the roadbed should be shown including: subbase, base, surfacing, shoulders, slopes, medians, barriers, curbs, gutters, ditches, sidewalks, and so forth.

A. Stationing

Only the alignment required to construct the project should be shown. Stationing should be continuous with no overlaps or gaps. Stationing for superelevated sections should include the superelevation transitions. Each different condition that cannot readily be shown on one typical section should have its own section. Stationing, where that section applies, should be shown under the section. An overall Right of Way dimension shall be included. The designer should ensure that the entire project has an appropriate typical cross section.

B. Scale

Typical cross sections should be drawn to a scale that will allow the typical to fill the width of the page. Show the scale (horizontal and vertical) in the title block.

For horizontal dimensions, use decimals, not feet and inches (only for fractional dimensions, example 12’ not 12.00’; 2.5’ not 2’-6”; 2.67’ not 2’-8”). Vertical dimensions are typically in inches (example 18” not 1’-6” or 1.5’).

1.02.05 (continued)

C. Notes, Charts, Legends, & Conventions

Typical section notes should be placed on the lower right corner of the first typical cross section sheet.

The HMA application chart shall be shown on the first typical cross section sheet which has an HMA section. This chart shall include: the HMA mix, the rate of application, the performance grade, and remarks.

The concrete joint legend shall be shown on only the first concrete typical cross section sheet. All concrete typical sections should indicate the location and type of longitudinal joints required.

D. Existing Typical Cross Section

Often, a separate existing typical cross section is needed to show the existing conditions and removals.

When the existing conditions are incorporated into the proposed cross section, they should be shown with dashed lines.

Typical sections should show pavement and shoulder slopes and grading or subbase slopes. Also, show existing and proposed crown point location.

1.02.06 (revised 6-17-2013)

Miscellaneous Details

Occasionally, a miscellaneous detail may need to be added to address a special item or treatment on a project. The drawing is placed in the construction plans with the miscellaneous detail sheets.

1.02.07 (revised 6-17-2013)

Note Sheet

The purpose of the Note Sheet is to show, in a convenient location, the General Notes applying to the project.

1.02.08 (revised 10-22-2012)

Miscellaneous Estimates

The miscellaneous estimates section is for listing all pay items that do not appear elsewhere in the plans. This estimate usually includes the following items:

- Contractor Staking
- Concrete and HMA Quality Initiative
- Project Cleanup
- Erosion and Sedimentation Control Items
- Slope Restoration Items
- Subgrade Correction Items
- Maintaining Traffic Items
- Pavement Joints
- Pavement Markings and Signs if separate sheets are not part of the plans

Items are not limited to those shown above nor are these items always shown on the miscellaneous estimate sheet. If pay items can conveniently and clearly be shown on the plans, there is no need to include them in the miscellaneous estimate sheet.

Quantities shown in the miscellaneous estimate area should be separated by job number and local participation, when applicable. If a project includes several Act 51 participating cities, a column for quantities in each city will be necessary.

1.02.12 (revised 6-17-2013)

Removal, Construction Plan, and Profile Sheets

A. Removal

Separate Removal Sheets should be considered depending on the type, location, and complexity of the project. Removal Sheets are almost always needed for projects in congested urban areas.

An early determination should be made whether or not to include removal items on the construction plan sheets. If this would cause the plans to become cluttered and difficult to read, then separate Removal Sheets should be used. The Removal Sheets should show all existing topography within the project limits.

All items for removal will be indicated on these sheets. Once it has been determined that an item is to be removed and it has been indicated on the Removal Sheet, the item should no longer appear on the construction plan sheet. Slope stake lines should be shown to determine removal limits. The edges of proposed pavement or back of curb may also be beneficial in determining removals.

Subdivision plat information shall be shown on the Removal Sheets.

The Removal Sheets shall only show the alignment required to construct the project.

1.02.12

B. General

Construction plan and profile sheets are the "meat" of a set of plans. Plan sheets are “overhead” maps or pictorial representations of the project to be constructed. Plan sheets indicate what items need to be removed, replaced, relocated, reconstructed, constructed, or adjusted. Plan sheets must be clear, complete, correct, and uniform to convey to the contractor how to construct the project and what materials will be needed.

P.C., P.I., and P.T. Station labels shall be shown for the alignment required to construct the project.

If the scope of work involves a significant amount of drainage and utility renovation or removal, separate plan sheets may be required for each phase of construction (removal, utility and drainage, and construction).

Profile sheets show existing elevations and proposed elevations of the finished construction project. They also show drainage details including existing and proposed ditch elevation, top of curbs, drainage structures, sewers, and other utility information. Profile sheets should also show grading information, such as front and back slopes, peat location and treatment, and excavation and embankment quantities.

Profile sheets may not be required on all projects, such as when the grade is not changing, or it is changing at a uniform rate.

1.02.12 (continued)

Removal, Construction Plan, and Profile Sheets

C. Guidelines

1. Plan and Profile Scale

Rural Projects

Plan	1" = 100' (1" = 80' for reconstruction)
Profile	1" = 100' horizontal 1" = 10' vertical

Urban Projects

	Preferred	Acceptable
Plan	1" = 80'	1" = 100'
Profile	1" = 80' horizontal 1" = 8' vertical	1" = 100' horizontal 1" = 10' vertical

A scale of 1"=40' can be used for congested areas and for detailed grades. Reduced scales, 1"=200' or smaller, can be used for staging plans, pavement markings, vicinity or drainage maps and interchange drawings so that the entire project or interchange can be shown on one plan sheet.

2. Sheet Breaks

Preferred sheet breaks are as follows:

200 Scale: 2400' per sheet (24 stations)
100 Scale: 1200' per sheet (12 stations)
80 Scale: 1000' per sheet (10 stations)
40 Scale: 500' per sheet (5 stations)

1.02.12C (continued)

3. Information

Plan sheets should include the following, except for the noted items which may be shown on separate sheets.

1. North orientation arrow.
2. City limits.
3. Township, range, and section.
4. Existing pavement description including width and type (indicate limits of milling or surfacing).
5. ROW, (existing and proposed) including cross roads.
6. Slope stake lines.
7. House numbers on urban projects and rural projects, if available.
8. Property owners names on rural projects, when available.
9. Existing drainage, direction of flow, size, and type of all existing culverts and sewers.
10. Pay items and leaders to specific work types.
11. "This Sheet" quantity listings shall include only items that are not included elsewhere on the sheet.
12. Detail of guardrail installation(s).
13. Existing utilities – NOTE: Flag all gas, oil & underground electric power lines as "hazardous or flammable material". Flag all underground telephone, water transmission, and fiber optics as “caution critical utility”. All other underground private and municipal utilities should be shown in standard line coding with the type of utility, size, type of pipe (if known) and flow arrows (if applicable). Generally, overhead utilities (excluding overhead high voltage transmission lines) are not shown on the plans, unless these utilities are in the vicinity of structures such as bridges or culverts where cranes are in operation.
14. Existing Driveways.
15. Streets and Crossroads - name, width, surface, etc.
16. Soil survey boundaries identified with soil series.

1.02.12C (continued)

Removal, Construction Plan, and Profile Sheets

Profile sheets shall show the following when applicable:

1. Proposed plan and ditch grade (include curb grades).
2. Type lines (showing front slope, back slope, ditch information, superelevation, and transitions, etc.)
3. Crossroad or street profiles
4. Sidewalk profiles and/or top of curb grade profiles.
5. Existing ground profile and ground points - side profiles.
6. Vertical Curves
   a. K-value
   b. P.I. station and curve length
7. Tangent Grades.
8. Temporary roads.
9. Water table information
10. Rock, peat, muck, undercut locations, and treatments.
11. Cross culverts
12. Existing and proposed underground utilities (sewer, water, telephone, electrical, pipelines, etc.).
13. Existing drainage structures and pipes - dashed lines.
14. Proposed drainage structures and sewers - solid lines.
15. Proposed flow line elevations to nearest hundredths of a foot.
16. Existing (surveyed) flow line elevations to nearest hundredths of a foot. Estimated existing flow lines should be shown to the nearest tenth of a foot.
17. Earthwork limits and quantities.
18. Other miscellaneous quantities.
19. Station equations.

1.02.12C (continued)

Profile sheets should reference the alignment required to construct the project or plan grade profile line showing both existing grade and proposed grade. Side profiles should also be indicated, usually a set distance left and right of the alignment, i.e., 30 feet left and 30 feet right. Rural projects would use the side profiles to plot existing and proposed ditch grades; urban projects to indicate top of curb grades or sometimes gutter or sidewalk grades. Rural projects also usually include ground points at even stations and usually 100 feet left and right of centerline. These points give the designer an indication of the lay of the land in the project area but certainly do not replace the need for cross sections.

4. Sheet Orientation and Stationing

Plan sheets should be set up to avoid breaking at important design features such as interchanges, intersections, or curves starting or ending at the beginning or end of a sheet. Sheets on curves should be angled to produce a balanced sheet; the tangent sections should be near the center of the plan sheet.

Stationing should be from left to right, should not be overlapped sheet to sheet, and should be the same as the profile stationing. Plan and profile stationing should ideally begin and end with a station multiple of 100 feet (e.g. station 3+00 or 6+00). Stations will be based on hundreds of feet. Each “tick” mark is identified as follows: 1, 2, 3, etc. Alignments will be "ticked" and labeled at 100 foot intervals.

1.02.12 (continued)

Removal, Construction, and Profile Sheets

D. Quantities

Pay items, pay units, and estimated number of units are shown on the construction plan and profile sheets.

Construction quantities can be shown by individual notes, in tabular form as quantities per sheet, or a combination of both methods. Important items to remember when placing quantities on the plan and profile sheets

1. Use the proper (correct) pay items. Pay items should agree with the special provisions, supplemental specifications, standard specifications, and the pay item code book.

2. Use the correct pay units from the same sources as above. Various pay items have more than one unit of measure. The designer is to use judgment to decide which unit of measure is best for the situation.

3. Pay items should be included in only one place on plan and profile sheets, i.e., if pay items are shown by note and leader they should not also appear in the "quantities this sheet" compilation.

4. All quantities should be computed and checked for accuracy.

5. All information required to construct the pay item must appear in its proper location and meet all policies, procedures, standards, and guidelines established by MDOT, FHWA, AASHTO, and other agencies. Guardrail installations, where length, location, and offsets are extremely important, are an excellent example of the need for complete information.

6. Agency Participation, if applicable.

1.02.12D (continued)

Quantities generally shown on the plan sheet or the plan portion of a plan and profile sheet include:

- Removals and adjustments (if separate removal sheets are not included).
- Pavement and surfacing quantities including curb, curb and gutter, valley gutter, shoulders, sidewalks, etc.
- Guardrail and median barrier.
- Erosion control item locations.
- Sewers, drainage structures, culverts and other utility alterations.
- Driveway and approach treatments.

Profile sheets will not include quantities. Excavation quantities are shown on the removal sheet. Embankment and subbase quantities are shown on the construction sheet.

1.02.20 (continued)

Log of Borings

Information that needs to be supplied along with the Borings are: date the boring was taken, who performed the boring, and the level of the water table (or "dry").

Construction Field Services Division and the Region/TSC Soils Engineer will analyze the boring information and make recommendations regarding pavement structure, subbase requirements, subgrade undercutting, foundation recommendations, sewer and culvert trench undercutting, bedding, dewatering needs, and other special treatments.

1.02.21 (revised 10-22-2012)

Special Details

Special Detail plan sheets are used to show project specific items and details not covered by the standard plans. They are located in a folder in ProjectWise for MDOT internal access. These details are typically draft versions of new or revised standard plans awaiting final approval. These special detail sheets should be included in the final set of construction plans.

Modified Special Detail sheets may also be prepared by the designer to show other necessary details not covered by a standard plan or special detail provided by the Standards Unit. These may include gore details, guardrail installations, surfacing details and transitions, modifications of standard items, drainage details and so forth. See Section 1.02.02B for more information.

1.03 (revised 10-22-2012)

MISCELLANEOUS

1.03.01 (revised 6-17-2013)

Order of Plan Sheets

Plans should be assembled in the following order:

Title Sheet
Project Information Sheet
Vicinity Map
Drainage Map
Typical Cross Section Sheets
Miscellaneous Detail Sheets
(Unique Treatments for Specific Areas)
Note Sheet
Miscellaneous Estimates
Standard Symbol Sheet
(Legend Sheet)
Witnesses and Benchmarks
Survey Information Sheets
Alignment/ROW Sheets
*Plan and Profile Sheets
Interchanges/Ramps-Plan and Profile Sheets
Crossroads-Plan and Profile Sheets
Detail Grades
Maintaining Traffic/Construction Staging Sheet
Signal Plans
Permanent Signing Plans
Pavement Marking Sheets
Utility Sheets (lighting, water, sewer, etc.)
Wetland Mitigation Sheet
Rest Area/Landscaping Plans
Soil Boring and Pavement Core Sheet
Standard Special Detail Sheets
Bridge Plans

* Removal, construction, drainage if needed, and profile sheets should be arranged in this order according to station limits

Only the sheets included in a set of plans should appear in the index of the title sheet.

1.03.02 (revised 6-17-2013)

Lettering, Notes, Conventions

See the Sample Plans for examples of drafting conventions, symbols, line weights, etc. to use in preparing plans.

1.03.03 (revised 11-28-2011)

Critical Path Method (CPM)

Critical Path diagrams indicate construction events, the sequence of each event, the time required to complete each event, and which events become "critical" to the completion of the project. The designer may be asked to complete a critical path diagram for all but the most simplistic projects.

Critical path diagrams are not a part of the plans, but are valuable for setting construction completion dates, open to traffic dates and other intermediate dates. Contractors interested in bidding the project can receive the CPM prepared by the designer, but are encouraged to prepare their own critical path diagrams. CPM's should not be given to contractors without a disclaimer worded similar to the following:

B.P.I.A. Company
123 Money Street
Mission Model, MI 48917

Attached is a copy of the critical path and computer printout that you requested for the subject project. The critical path information was used as one of the aids in arriving at the final completion date and/or interim completion dates. It is not officially part of the plans and any errors or omissions will not relieve the contractor from meeting the dates set in the progress schedule in the proposal.

Critical paths are very important for high impact and expedited projects. The CPM will show which items or events need to be expedited to complete the project. Early and late start and finish dates, seasonal limitations, holiday and special event shutdowns, and ordering and delivery of materials all enter into the formulation of the path.

1.03.03 (continued)

When preparing the CPM, it is important to consider the length of the work week. With weather being a consideration, a four-day work week can be used on normal projects. On expedited projects, however, a five or even six-day work week may be appropriate.

Information on times for construction events, sequences, etc. is available from Construction Field Services Division. The designer should work closely with Construction Field Services Division and/or the project engineer when preparing the CPM.

1.03.04 (revised 10-22-2012)

Roadway Cross Sections

Roadway cross sections are very valuable to the designer. They are one of the main items used to design the project. Cross sections are used by the designer to visualize what the roadway will look like in the field.

Roadway cross sections show the existing roadway conditions. They are used to determine earthwork, draw slope stake lines, determine right of way needs, fit proposed to existing, determine driveway and crossroad grades, determine clearing and removal limits, determine drainage requirements, set front and back slopes, and determine much more information needed to design the project.

Cross sections should be plotted for all projects with grade and slope changes. Exaggerated cross sections can be very helpful in setting curb grades on urban projects.

The roadway cross sections are not included in the plans but should be sent to the project engineer before the project is under construction. The sections can be very informative to the construction personnel and, many times, help to explain the design shown on the plans.

1.04

LOG PROJECTS

1.04.01 (revised 6-17-2013)

Preparing a Log Project

Most designs for construction projects will be prepared using full size plan sheets. Occasionally a project may be very straightforward and uncomplicated. In such cases, the design can be completed with sketches and a written narrative. Such a design is called a "Log Project".

In a log project the title sheet, typical cross sections, and details are prepared on 8½" x 11" sheets. The work plan (log of project), including pay items, is written in narrative form describing what and where construction operations will occur.

Locations are referenced by station which is often obtained by a distance measuring device or from old plans, rather than an accurate survey. Existing right of way maps, reduced to 8½" x 11" are sometimes included in the log.

Log projects provide a simple design when specific detail or accuracy is not required. Because of the complexity and the need for detail in most major road design projects, the use of log plans are not very common. In general, projects with estimated construction cost exceeding $2.5 million should be prepared using full size plan sheets.

1.04.01 (continued)

Log projects include much of the same information that is in a normal plan project, including utilities, standard notes, applicable standard plans and special details, typical cross sections, maintaining traffic details, staging, pavement markings, signing, and so forth. All project detail sheets and the descriptive write-up are prepared on 8½" x 11" sheets and should be included with the supplemental specifications, special provisions, and other bid documents in the proposal format.

The sheets for log projects should be assembled in the same general order listed for plan sheet projects as they apply for the log project (see Section 1.03.01). If a sheet index is listed, it should be listed on a separate sheet following the title sheet. Generally the log of project write up precedes the typical cross sections. However the reverse may apply as necessary to provide a logical sequencing of information.

Log projects are required to include Pay Items for Monument Preservation, Monument Preservation Vertical, Monument Box, Protect Corners, and Monument Box Adjust.

3.02.02

Preliminary Estimate

The preliminary estimate consists of only the major items for the project. Unit prices are obtained from the Specifications, Estimates and Plan Review Section and used by the Unit to determine project costs.

The Specifications and Estimates Section requires a set of Preliminary Plans and an Engineer's Preliminary Estimate of Cost for Preliminary Plan, Form 0287, with all major items listed before they can provide unit prices. (6-17-2013)

The Engineering and Contingencies on the Preliminary Estimate are to be approximately 15 percent for all projects. The total estimate is to be rounded off to the nearest $100. (8-6-92)

3.02.02 (continued)

Preliminary Estimate Items (8-20-99)

1. Preliminary

    Temporary Structures
    Removal of Existing Structures
    Removal of Portions of Structures
    Cofferdams

2. Substructure

    Unclassified Excavation
    Temporary Steel Sheet Piling
    Permanent Steel Sheet Piling
    Foundation Piling
    Tremie Concrete
    Substructure Concrete
    Steel Reinforcement - Substructure
    Substructure Repair

3. Superstructure

    Superstructure Concrete
    Steel Reinforcement - Superstructure
    Structural Steel Fabrication & Erection
    Shear Developers
    Prestressed Concrete Beams
    Prestressed Concrete Deck
    Expansion Joint, if cost is a major item
    Bridge Railing
    Concrete, Bridge Deck Overlay
    Cleaning and Coating Structural Steel

4. Miscellaneous

    Structure Backfill
    Slope Protection
    Riprap
    Structure Embankment
    Temporary Supports
    Channel Excavation
    Approach Work(if incl. in Bridge Plans)
    Maintaining Traffic costs

Where some of the above items represent a minor percentage of project cost, they may be grouped and given a lump sum price.

MICHIGAN DESIGN MANUAL
BRIDGE DESIGN

CHAPTER 7

DESIGN CRITERIA - NEW AND RECONSTRUCTION PROJECTS

7.01 GENERAL

Accelerated Bridge Construction (ABC) (6-17-2013)

A. Background and Process

Accelerated Bridge Construction (ABC) techniques, including Prefabricated Bridge Elements & Systems (PBES) and Full Structural Placement Methods, are recognized by the Michigan Department of Transportation (MDOT) and the Federal Highway Administration (FHWA) as important and effective methods to construct or rehabilitate highway structures, while reducing the impact of bridge construction activities on mobility, the economy, and user delay.

ABC may include new technologies in the form of construction and erection techniques, innovative project management, high performance materials, and pre-fabricated structural elements to achieve the overall goals of shortening the duration of construction impacts to the public, encouraging innovation, ensuring quality construction, and expected serviceability of the completed structure.

All major rehabilitation or reconstruction bridge projects should be evaluated at the Scoping Process, see Chapter 6 of the Scoping Manual, to determine if ABC is suitable and provides a benefit; taking into consideration safety, construction cost, site conditions, life cycle cost of the structure, MDOT's mobility policy and user delays, and economic impact to the community during construction.

All proposed ABC candidate projects are subject to Statewide Alignment Team Bridge (Bridge Committee) approval. Candidate projects during the scoping phases are to be presented at the monthly Bridge Committee meeting. The Bridge Committee will review candidate projects for further evaluation, and grant approval to pursue ABC techniques and determine availability of Bridge Emerging Technology funding. Once the Bridge Designer is assigned the project they shall determine if the ABC methodology is feasible from a design aspect. Issues shall be discussed with the Bridge Development Engineer, Bridge Field Services Engineer, and subsequently the Bridge Committee. A Scope Verification meeting may be necessary to resolve design and constructability issues (see Section 2.02.14 &.15 of Bridge Design Manual).

If the determination has been made that ABC will be implemented on a specific project, the next step is to choose the methods that are technically and economically feasible.

Accelerated Bridge Construction (ABC)

B. Prefabricated Bridge Elements & Systems (PBES)

Prefabricated Bridge Elements & Systems (PBES) can be built on site away from traffic if site conditions warrant, or they can be fabricated off site and shipped to the site. Both methods offer advantages in quality control compared to cast in place construction where schedule or staging dictate the work progression. Non-prestressed reinforced concrete elements can be considered for on-site, or near site fabrication. Prestressed elements must be fabricated in a Prestressed Concrete Institute (PCI) certified plant.

1. Constructability

   Erection of prefabricated elements and the connection details will require special attention being paid to the following:

   a. Dimensional Tolerances:

      (1) Connections between elements must accommodate field erection. This may require staggering, or mechanically splicing connection or closure pour reinforcement or grouted splicers.

      (2) Elements fabricated off site should be test fit or otherwise confirmed to be of the correct dimensions prior to shipping.

      (3) Templates should be used to ensure correct fit-up between prefabricated elements or between a prefabricated element and a cast in place element.

      (4) Connection details should be standardized.

7.01.19 (continued)

   b. The weight and size of precast elements:

      (1) Need to ensure elements can be erected with contractor's equipment. Typically, PBES element weights should be limited to 40 tons.

      (2) Need to ensure elements can be shipped to the site.

      (3) Need to ensure elements can be erected without long term lane closures.

7.01.19 (continued)

Accelerated Bridge Construction (ABC)

B. Prefabricated Bridge Elements & Systems (PBES)

2. Prefabricated Element Types

The following prefabricated elements may be considered for use on MDOT bridge projects:

a. Precast full depth deck panels.

(1) Panels may be connected by reinforcement splice with closure pours using high strength concrete or ultra-high performance concrete or they may be transverse or longitudinally post tensioned.

(2) Panels are sensitive to skew and beam camber and haunches.

(3) Panels using post tensioning may have long term maintenance concerns.

(4) Riding/wearing/sealing surface should be provided such as epoxy overlay or HMA overlay with waterproofing membrane.

(5) Dimensional tolerances are very tight.

(6) Additional geometry control will be required, and should be stated in the plans to be included in the Contractor Staking pay item.

(7) Match casting may be used to assure proper fit-up when complex geometry is required.

7.01.19 (continued)

b. Decked Beam elements.

(1) Two steel beams connected with deck (modular beams).

(2) Decked bulb T beams.

(3) Decked prestressed spread box beams.

(4) Decked side-by-side box beams

(5) These systems rely on full shear and moment capacity joints and closure pours.

Ultra High Performance Concrete may be used to reduce the lap length of the connection detail.

(6) Camber control may require pre-loading of erected modular units, or partial post tensioning until all dead load deflections are applied.

(7) Casting the roadway cross slope and/or vertical alignment curvature on modular units may be difficult, consider variable thickness overlays to develop required geometry.

7.01.19 (continued)

Accelerated Bridge Construction

B. Prefabricated Bridge Elements & Systems (PBES)

c. Pier Elements.

(1) Precast pier caps.

(2) Precast columns.

(3) Precast pile caps.

(4) These systems rely on grouted or mechanical reinforcement splices to develop reinforcement sufficiently to transfer reactions from one element to the next.

(5) Consider multiple smaller caps spanning two columns as opposed to one large cap.

(6) Pier columns that directly support beams without pier caps may be considered.

(7) Pier column voids can be considered to reduce weight. Weight of PBES elements should be limited to 40 tons where possible.

7.01.19 (continued)

d. Abutment and Wall Elements.

(1) Precast abutment panels.

(2) Precast footings.

(3) Precast backwalls and wingwalls.

(4) These systems rely on grouted or mechanical reinforcement splices to develop reinforcement sufficiently to transfer reactions from one element to the next

(5) Voids can be considered to reduce weight. Weight of PBES elements should be limited to 40 tons where possible.

e. Precast Approach Slabs

Dimensional tolerances are very tight for all Prefabricated Bridge Elements & Systems (PBES). The tolerance sensitivity required when erecting prefabricated elements may require dual or independent survey contracts to ensure proper fit up, camber, deflections and finished grades.

Accelerated Bridge Construction

C. Full Structural Placement Methods

The following full structural placement methods may be considered for use on MDOT bridge projects:

1. Self-Propelled Modular Transport (SPMT):

   a. Computer controlled platform vehicle with movement precision to within a fraction of an inch.

   b. Capable of lifting 165 to 3,600 tons.

   c. Vertical lift range of 36 to 60 inches.

   d. Axle units can be rigidly coupled longitudinally and laterally.

   e. Move costs can be up to $500,000 (mobilization costs are significant, so SPMTs should be considered on corridors where multiple bridges may be moved).

   f. Limited to use on sites with minimal grade changes.

2. Lateral Bridge Slide:

   a. Bridge section is built on temporary supports adjacent to existing substructure.

   b. Bridge section bears on stainless steel, or other low friction surface such as Teflon.

   c. Existing substructure units can be reused, or new units constructed with minimal impact to traffic. Consider converting multiple span bridges into single spans so that proposed substructure units can be constructed in different locations from existing without impacting the operation of the existing structure.

7.01.19 (continued)

   d. Bridge section is laterally jacked, or rolled into place.

   e. Required jacking forces must overcome static and kinetic friction.

   f. Consideration shall be given for the need to push and pull the bridge to meet movement tolerances. The hydraulic ram or cable with rollers shall be sized to accommodate both movements.

   g. Cost to slide a bridge is approximately $50,000 to $100,000 depending upon size of the bridge, and the number of spans.

   h. Additional stiffeners may be required on beams at point of jacking force application.

   i. Additional reinforcement in concrete elements may be required to control jacking stresses.

   j. Grade raises can be accommodated by casting backwalls and abutment portions on the proposed superstructure, and sliding over proposed sawcut elevations on existing abutments.

   k. Deflections of temporary substructure units must be considered, and the connection from the temporary substructure units to the permanent substructure units must be sufficiently rigid as to allow minimal deflections at the transition.

7.01.19 (continued)

Accelerated Bridge Construction

C. Full Structural Placement Methods

3. Incremental (Longitudinal) Launching:

   a. Bridge section is built near approaches, and then longitudinally launched into place.

   b. Prestressing may be required for concrete elements due to alternating bending moments generated during launch.

   c. Launching trusses, gantries, and hydraulic systems may be considered.

Allowing the contractor to select methods of placement may also lead to additional innovations and acceleration to the project schedule. Depending on the complexity of the overall project, innovative contracting methods may also be used in conjunction with ABC/PBES techniques. Innovative contracting methods are approved on a project by project basis by the MDOT Innovative Contracting Committee, and the MDOT Engineering Operations Committee. For more information see the Innovative Construction Contracting Manual.

The Federal Highway Administration provides additional information about ABC and PBES at the following website: http://www.fhwa.dot.gov/bridge/abc/index.cfm.

CHAPTER 7 - LRFD

DESIGN CRITERIA - NEW AND RECONSTRUCTION PROJECTS

7.01 GENERAL

Accelerated Bridge Construction (ABC) (6-17-2013)

A. Background and Process

Accelerated Bridge Construction (ABC) techniques, including Prefabricated Bridge Elements & Systems (PBES) and Full Structural Placement Methods, are recognized by the Michigan Department of Transportation (MDOT) and the Federal Highway Administration (FHWA) as important and effective methods to construct or rehabilitate highway structures, while reducing the impact of bridge construction activities on mobility, the economy, and user delay.

ABC may include new technologies in the form of construction and erection techniques, innovative project management, high performance materials, and pre-fabricated structural elements to achieve the overall goals of shortening the duration of construction impacts to the public, encouraging innovation, ensuring quality construction, and expected serviceability of the completed structure.

All major rehabilitation or reconstruction bridge projects should be evaluated at the Scoping Process, see Chapter 6 of the Scoping Manual, to determine if ABC is suitable and provides a benefit; taking into consideration safety, construction cost, site conditions, life cycle cost of the structure, MDOT's mobility policy and user delays, and economic impact to the community during construction.

All proposed ABC candidate projects are subject to Statewide Alignment Team Bridge (Bridge Committee) approval. Candidate projects during the scoping phases are to be presented at the monthly Bridge Committee meeting. The Bridge Committee will review candidate projects for further evaluation, and grant approval to pursue ABC techniques and determine availability of Bridge Emerging Technology funding. Once the Bridge Designer is assigned the project they shall determine if the ABC methodology is feasible from a design aspect. Issues shall be discussed with the Bridge Development Engineer, Bridge Field Services Engineer, and subsequently the Bridge Committee. A Scope Verification meeting may be necessary to resolve design and constructability issues (see Section 2.02.14 &.15 of Bridge Design Manual).

If the determination has been made that ABC will be implemented on a specific project, the next step is to choose the methods that are technically and economically feasible.

Accelerated Bridge Construction (ABC)

B. Prefabricated Bridge Elements & Systems (PBES)

Prefabricated Bridge Elements & Systems (PBES) can be built on site away from traffic if site conditions warrant, or they can be fabricated off site and shipped to the site. Both methods offer advantages in quality control compared to cast in place construction where schedule or staging dictate the work progression. Non-prestressed reinforced concrete elements can be considered for on-site, or near site fabrication. Prestressed elements must be fabricated in a Prestressed Concrete Institute (PCI) certified plant.

1. Constructability

   Erection of prefabricated elements and the connection details will require special attention being paid to the following:

   a. Dimensional Tolerances:

      (1) Connections between elements must accommodate field erection. This may require staggering, or mechanically splicing connection or closure pour reinforcement or grouted splicers.

      (2) Elements fabricated off site should be test fit or otherwise confirmed to be of the correct dimensions prior to shipping.

      (3) Templates should be used to ensure correct fit-up between prefabricated elements or between a prefabricated element and a cast in place element.

      (4) Connection details should be standardized.

7.01.19 (continued)

   b. The weight and size of precast elements:

      (1) Need to ensure elements can be erected with contractor's equipment. Typically, PBES element weights should be limited to 40 tons.

      (2) Need to ensure elements can be shipped to the site.

      (3) Need to ensure elements can be erected without long term lane closures.

Accelerated Bridge Construction (ABC)

B. Prefabricated Bridge Elements & Systems (PBES)

2. Prefabricated Element Types

The following prefabricated elements may be considered for use on MDOT bridge projects:

a. Precast full depth deck panels.

(1) Panels may be connected by reinforcement splice with closure pours using high strength concrete or ultra-high performance concrete or they may be transverse or longitudinally post tensioned.

(2) Panels are sensitive to skew and beam camber and haunches.

(3) Panels using post tensioning may have long term maintenance concerns.

(4) Riding/wearing/sealing surface should be provided such as epoxy overlay or HMA overlay with waterproofing membrane.

(5) Dimensional tolerances are very tight.

(6) Additional geometry control will be required, and should be stated in the plans to be included in the Contractor Staking pay item.

(7) Match casting may be used to assure proper fit-up when complex geometry is required.

7.01.19 (continued)

b. Decked Beam elements.

(1) Two steel beams connected with deck (modular beams).

(2) Decked bulb T beams.

(3) Decked prestressed spread box beams.

(4) Decked side-by-side box beams

(5) These systems rely on full shear and moment capacity joints and closure pours.

Ultra High Performance Concrete may be used to reduce the lap length of the connection detail.

(6) Camber control may require pre-loading of erected modular units, or partial post tensioning until all dead load deflections are applied.

(7) Casting the roadway cross slope and/or vertical alignment curvature on modular units may be difficult, consider variable thickness overlays to develop required geometry.

7.01.19 (continued)

Accelerated Bridge Construction

B. Prefabricated Bridge Elements & Systems (PBES)

c. Pier Elements.

(1) Precast pier caps.

(2) Precast columns.

(3) Precast pile caps.

(4) These systems rely on grouted or mechanical reinforcement splices to develop reinforcement sufficiently to transfer reactions from one element to the next.

(5) Consider multiple smaller caps spanning two columns as opposed to one large cap.

(6) Pier columns that directly support beams without pier caps may be considered.

(7) Pier column voids can be considered to reduce weight. Weight of PBES elements should be limited to 40 tons where possible.

7.01.19 (continued)

d. Abutment and Wall Elements.

(1) Precast abutment panels.

(2) Precast footings.

(3) Precast backwalls and wingwalls.

(4) These systems rely on grouted or mechanical reinforcement splices to develop reinforcement sufficiently to transfer reactions from one element to the next

(5) Voids can be considered to reduce weight. Weight of PBES elements should be limited to 40 tons where possible.

e. Precast Approach Slabs

Dimensional tolerances are very tight for all Prefabricated Bridge Elements & Systems (PBES). The tolerance sensitivity required when erecting prefabricated elements may require dual or independent survey contracts to ensure proper fit up, camber, deflections and finished grades.

Accelerated Bridge Construction

C. Full Structural Placement Methods

The following full structural placement methods may be considered for use on MDOT bridge projects:

1. Self-Propelled Modular Transport (SPMT):

   a. Computer controlled platform vehicle with movement precision to within a fraction of an inch.

   b. Capable of lifting 165 to 3,600 tons.

   c. Vertical lift range of 36 to 60 inches.

   d. Axle units can be rigidly coupled longitudinally and laterally.

   e. Move costs can be up to $500,000 (mobilization costs are significant, so SPMTs should be considered on corridors where multiple bridges may be moved).

   f. Limited to use on sites with minimal grade changes.

2. Lateral Bridge Slide:

   a. Bridge section is built on temporary supports adjacent to existing substructure.

   b. Bridge section bears on stainless steel, or other low friction surface such as Teflon.

   c. Existing substructure units can be reused, or new units constructed with minimal impact to traffic. Consider converting multiple span bridges into single spans so that proposed substructure units can be constructed in different locations from existing without impacting the operation of the existing structure.

7.01.19 (continued)

   d. Bridge section is laterally jacked, or rolled into place.

   e. Required jacking forces must overcome static and kinetic friction.

   f. Consideration shall be given for the need to push and pull the bridge to meet movement tolerances. The hydraulic ram or cable with rollers shall be sized to accommodate both movements.

   g. Cost to slide a bridge is approximately $50,000 to $100,000 depending upon size of the bridge, and the number of spans.

   h. Additional stiffeners may be required on beams at point of jacking force application.

   i. Additional reinforcement in concrete elements may be required to control jacking stresses.

   j. Grade raises can be accommodated by casting backwalls and abutment portions on the proposed superstructure, and sliding over proposed sawcut elevations on existing abutments.

   k. Deflections of temporary substructure units must be considered, and the connection from the temporary substructure units to the permanent substructure units must be sufficiently rigid as to allow minimal deflections at the transition.

7.01.19 (continued)

Accelerated Bridge Construction

C. Full Structural Placement Methods

3. Incremental (Longitudinal) Launching:

   a. Bridge section is built near approaches, and then longitudinally launched into place.

   b. Prestressing may be required for concrete elements due to alternating bending moments generated during launch.

   c. Launching trusses, gantries, and hydraulic systems may be considered.

Allowing the contractor to select methods of placement may also lead to additional innovations and acceleration to the project schedule. Depending on the complexity of the overall project, innovative contracting methods may also be used in conjunction with ABC/PBES techniques. Innovative contracting methods are approved on a project by project basis by the MDOT Innovative Contracting Committee, and the MDOT Engineering Operations Committee. For more information see the Innovative Construction Contracting Manual.

The Federal Highway Administration provides additional information about ABC and PBES at the following website: http://www.fhwa.dot.gov/bridge/abc/index.cfm.

8.03 (continued)

GENERAL PLAN OF SITE SHEET

Z. Immediately after the construction of an abutment is completed, slope protection and seeding or sodding shall be placed on the adjacent embankment slopes. [Use for bridges over waterways.] (9-1-88)

AA. The haul route shown has been approved by the Michigan Department of Environmental Quality (MDEQ). A detailed alternate route may be proposed by the Contractor for MDOT review and submittal to the appropriate permitting agency. Additional time, project costs and any project delays resulting from submittal, approval, and/or denial of an alternate route request and implementation will be the responsibility of the contractor. [Use for bridges over waterways or wetlands.] (9-18-98) (11-28-2011) (6-17-2013)

BB. The haul route shall be according to Subsection 105.03 of the Standard Specifications. [Use for bridges over waterways or wetlands.] (9-18-98)

CC. Coordinates are not available for this project. [Use when coordinates not available due to lack of survey for project.] (12-5-2005)

8.05 (continued)

GENERAL PLAN OF STRUCTURE SHEET

I. The maximum foundation pressures are calculated to be:

Avg. D.L. only Case

Abutments _____ psf
Piers _____ psf

Avg. D.L. + L.L. Case

Abutments _____ psf
Piers _____ psf

[Note only on Preliminary Plans][Use Avg. D.L. Case for cohesive soils only.]

J. For details of slope protection, see Standard Plan B-102-Series.

K. The allowable fatigue stress range is based on a design life of 75 years (and an average daily truck traffic of _____). [For steel bridges only.] (8-6-92)

L. A cofferdam has not been provided for this structure. Other means of water control may be used, as approved by the Engineer, provided they do not disturb the stream bed. Water control, whether it be by cofferdam or other approved means, will be included in the bid item "Excavation, Fdn". [Use on stream crossings when water control measures other than a cofferdam are appropriate. See Subsection 7.03.04.] (12-5-2005)

M. The tremie seal design was based on a water surface at El. _____.

N. Placement of temporary barrier shall be according to Standard Plan R-126-Series or as approved by the Engineer. (Included in the pay item "Conc Barrier, Temp, Furn") [Use when the toe of temporary barrier on the traffic side is less than 4'-0" from a precipitous drop-off. Place note on staging sheet where applicable.] (12-5-2005)

8.05 (continued)

O. The riprap quantity is based on the lateral dimensions of the area to be protected, regardless of the number of layers required. The estimated weight of riprap is _____ tons. (9-18-98)

P. Alternate methods of stream diversion shall be submitted to the Engineer for approval. [Use when stream diversion method is detailed on Plan Sheet.] (9-18-98)

Q. Place riprap from El _____ to El _____. [Place this note in the vicinity to which it applies, when lateral limits are not fixed.]

R. False decking shall include the area bounded by (Reference Lines ___& __) (edges of shoulders) and outside flange fascias of Beams __& __. The estimated area is ____square feet during removal (and ____square feet during proposed construction). [Detail limits on the plans and include areas in note.] (12-5-2005)

S. Items cast into structural precast concrete to facilitate bridge construction (forming, finishing, etc.) shall be galvanized or epoxy coated. [Use for box and three-sided culverts, MSE walls, sound walls, precast bridge element systems, etc.] (6-17-2013)

8.07.01(continued)

Miscellaneous Notes

Z. The Contractor is to provide a sawed joint [1/3 deck slab thickness*] ” deep by ¼“ wide (minimum) in the top of slab at transverse construction joints over the backwall. If an optional construction joint is not used, the joint is to be sawed within 24 hours of placing the curing and is to be filled with Hot-Poured Joint Sealant. (Included in the bid item "Superstructure Conc, Form, Finish, and Cure, Night Casting (Structure No.)"). [Use at all construction joints over backwall.] *[Specify thickness to avoid cutting steel reinforcement.] (6-17-2013)

8.07.04 (continued)

Prestressed Concrete I-Beam & Box Beam Notes

P. Any holes cast or formed in the beam shall be filled with non-shrinking grout. Included in the bid item "Prest Conc 1800 Beam, Erect." [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

Q. The outer 6" of the top surface of the beam shall be fabricated to a smooth trowel finish, and then coated with a bond breaker as specified in section 708 of the Standard Specifications. [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

R. At the locations shown on these plans, coat the beams using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating in the manner specified in the Special provision for a distance of _____ feet, starting from the beam end at the joint, coating both sides and bottom of beam. [Use on Prestressed I beam and Spread box beam projects with expansion joints on the bridge. Show the locations to be coated on the erection diagram (new) or on existing General Plan of Structure sheet for existing beams.] (10-24-2001) (11-28-2011)

S. Coat the entire outside and bottom of the fascia beam using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating according to the Special Provision. [Use on Prestressed I beam and spread box beam projects where the beam ends are being coated and where coating fascia beams will not significantly effect the maintaining traffic scheme of the project.] (10-24-2001) (11-28-2011)

T. Steel for sole plates and other bearing components shall meet the requirements of AASHTO M 270 Grade 36. (12-5-2005)

8.07.04 (continued)

U. Beam steel reinforcement, including stirrups, shall be Grade 60 (ksi). [Use for all I-Beams and all box beams except 17" & 21" box beams.] (12-5-2005) (11-28-2011)

V. Field drilling shall be allowed for sign support anchors only. Location of anchors shall be as detailed on Traffic & Safety Sign Support Special Details. Any damage to the beams shall be repaired at the contractor's expense and approved by the Engineer. (11-28-2011)

W. Items cast into the beams to facilitate bridge construction (forming, finishing, etc.) shall be galvanized or epoxy coated. (8-20-2009) (3-18-2013) (6-17-2013)

X. Concrete inserts shall be 1" diameter; Dayton Superior, Type B-1 Standard or Type B-18; Williams Form, Type C 12; Meadow Burke, Type CT-2; or equal. Inserts shall be cast with the beams. Field installation of inserts is not allowed. [Use for I-Beams and spread box beams.] (11-28-2011)

Y. Adhesive anchors shall use a non-shrink grout (which is cementitious) listed in MDOT's Qualified Products List. [Use for adhesive anchors in sustained, tensile-load-only overhead applications such as traffic signals/sign supports.] (11-28-2011)

Z. Longitudinal beam steel reinforcement (A bars) shall be Grade 60 (ksi). Transverse beam steel reinforcement, stirrups and slab ties (ED & D bars), shall be Grade 40 (ksi). [Use for 17" & 21" box beams.] (11-28-2011)

8.03 (continued)

GENERAL PLAN OF SITE SHEET

Z. Immediately after the construction of an abutment is completed, slope protection and seeding or sodding shall be placed on the adjacent embankment slopes. [Use for bridges over waterways.] (9-1-88)

AA. The haul route shown has been approved by the Michigan Department of Environmental Quality (MDEQ). A detailed alternate route may be proposed by the Contractor for MDOT review and submittal to the appropriate permitting agency. Additional time, project costs and any project delays resulting from submittal, approval, and/or denial of an alternate route request and implementation will be the responsibility of the contractor. [Use for bridges over waterways or wetlands.] (9-18-98) (11-28-2011) (6-17-2013)

BB. The haul route shall be according to Subsection 105.03 of the Standard Specifications. [Use for bridges over waterways or wetlands.] (9-18-98)

CC. Coordinates are not available for this project. [Use when coordinates not available due to lack of survey for project.] (12-5-2005)

8.05 (continued)

GENERAL PLAN OF STRUCTURE SHEET

L. A cofferdam has not been provided for this structure. Other means of water control may be used, as approved by the Engineer, provided they do not disturb the stream bed. Water control, whether it be by cofferdam or other approved means, will be included in the bid item "Excavation, Fdn". [Use on stream crossings when water control measures other than a cofferdam are appropriate. See Subsection 7.03.04.] (12-5-2005)

M. The tremie seal design was based on a water surface at El. _____.

N. Placement of temporary barrier shall be according to Standard Plan R-126-Series or as approved by the Engineer. (Included in the pay item "Conc Barrier, Temp, Furn") [Use when the toe of temporary barrier on the traffic side is less than 4'-0" from a precipitous drop-off. Place note on staging sheet where applicable.] (12-5-2005)

O. The riprap quantity is based on the lateral dimensions of the area to be protected, regardless of the number of layers required. The estimated weight of riprap is _____ tons. (9-18-98)

P. Alternate methods of stream diversion shall be submitted to the Engineer for approval. [Use when stream diversion method is detailed on Plan Sheet.] (9-18-98)

Q. Place riprap from El _____ to El _____. [Place this note in the vicinity to which it applies, when lateral limits are not fixed.]

8.05 (continued)

R. False decking shall include the area bounded by (Reference Lines ___& __) (edges of shoulders) and outside flange fascias of Beams __& __. The estimated area is ____square feet during removal (and ____square feet during proposed construction). [Detail limits on the plans and include areas in note.] (12-5-2005)

S. Items cast into structural precast concrete to facilitate bridge construction (forming, finishing, etc.) shall be galvanized or epoxy coated. [Use for box and three-sided culverts, MSE walls, sound walls, precast bridge element systems, etc.] (6-17-2013)

8.07.01(continued)

Miscellaneous Notes

Z. The Contractor is to provide a sawed joint [1/3 deck slab thickness*] ” deep by ¼“ wide (minimum) in the top of slab at transverse construction joints over the backwall. If an optional construction joint is not used, the joint is to be sawed within 24 hours of placing the curing and is to be filled with Hot-Poured Joint Sealant. (Included in the bid item "Superstructure Conc, Form, Finish, and Cure, Night Casting (Structure No.)"). [Use at all construction joints over backwall.] *[Specify thickness to avoid cutting steel reinforcement.] (6-17-2013)

8.07.04 (continued)

Prestressed Concrete I-Beam & Box Beam Notes

P. Any holes cast or formed in the beam shall be filled with non-shrinking grout. Included in the bid item "Prest Conc 1800 Beam, Erect." [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

Q. The outer 6" of the top surface of the beam shall be fabricated to a smooth trowel finish, and then coated with a bond breaker as specified in section 708 of the Standard Specifications. [Use for Michigan 1800 Prestressed I-Beam.] (12-5-2005)

R. At the locations shown on these plans, coat the beams using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating in the manner specified in the Special provision for a distance of _____ feet, starting from the beam end at the joint, coating both sides and bottom of beam. [Use on Prestressed I beam and Spread box beam projects with expansion joints on the bridge. Show the locations to be coated on the erection diagram (new) or on existing General Plan of Structure sheet for existing beams.] (8-20-2009)

S. Coat the entire outside and bottom of the fascia beam using a material selected from the Special Provision for Concrete Surface Coatings. Apply the coating according to the Special Provision. [Use on Prestressed I beam and spread box beam projects where the beam ends are being coated and where coating fascia beams will not significantly effect the maintaining traffic scheme of the project.] (8-20-2009)

T. Steel for sole plates and other bearing components shall meet the requirements of AASHTO M 270 Grade 36. (12-5-2005)

8.07.04 (continued)

U. Beam steel reinforcement, including stirrups, shall be Grade 60 (ksi). [Use for all I-Beams and all box beams except 17" & 21" box beams.] (12-5-2005) (11-28-2011)

V. Field drilling shall be allowed for sign support anchors only. Location of anchors shall be as detailed on Traffic & Safety Sign Support Special Details. Any damage to the beams shall be repaired at the contractor's expense and approved by the Engineer. (8-20-2009)

W. Items cast into the beams to facilitate bridge construction (forming, finishing, etc.) shall be galvanized or epoxy coated. (8-20-2009) (3-18-2013) (6-17-2013)

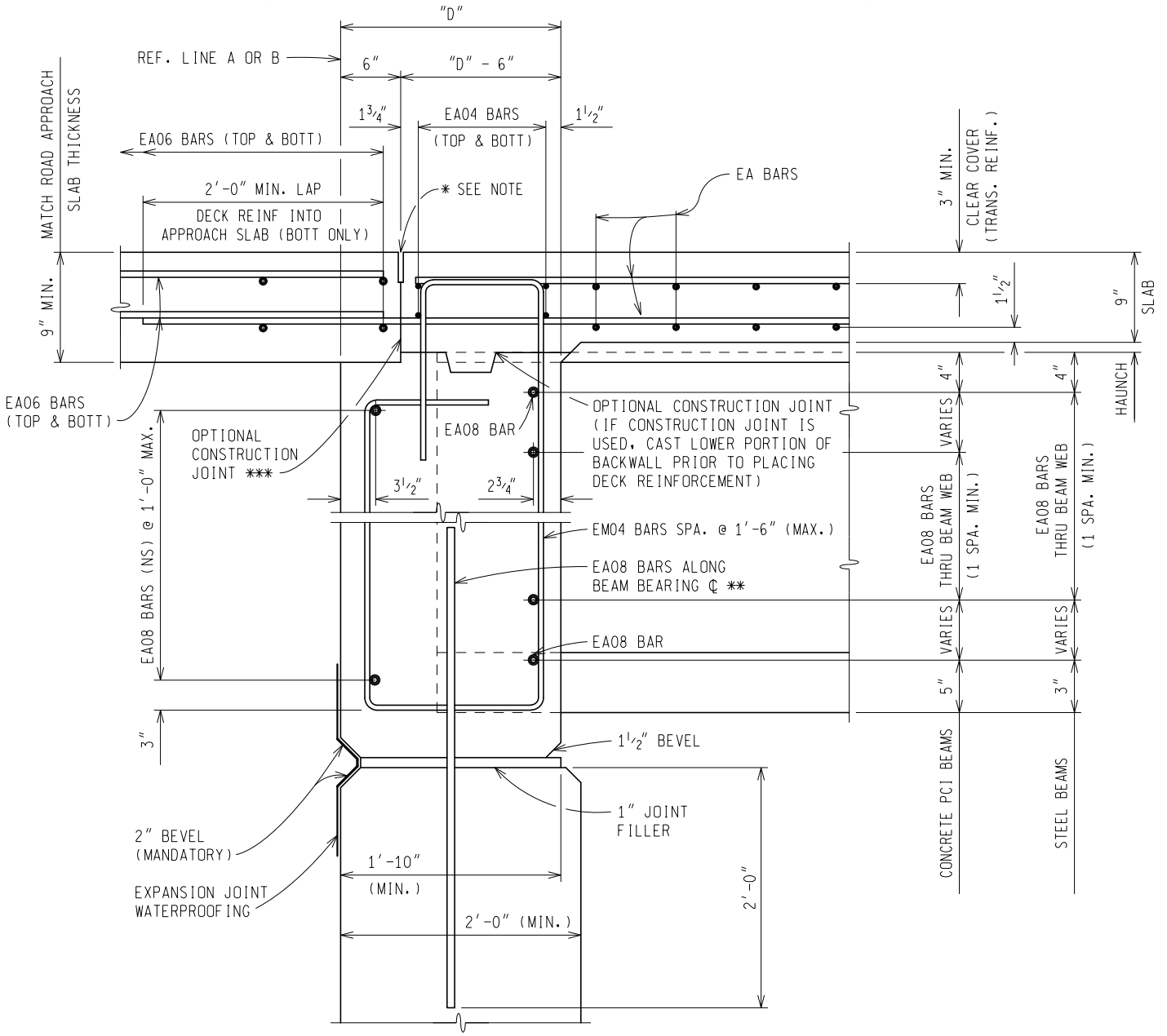
X. Concrete inserts shall be 1" diameter; Dayton Superior, Type B-1 Standard or Type B-18; Williams Form, Type C 12; Meadow Burke, Type CT-2; or equal. Inserts shall be cast with the beams. Field installation of inserts is not allowed. [Use for I-Beams and spread box beams.] (8-20-2009)

Y. Adhesive anchors shall use a non-shrink grout (which is cementitious) listed in MDOT's Qualified Products List. [Use for adhesive anchors in sustained, tensile-load-only overhead applications such as traffic signals/sign supports.] (8-20-2009)

Z. Longitudinal beam steel reinforcement (A bars) shall be Grade 60 (ksi). Transverse beam steel reinforcement, stirrups and slab ties (ED & D bars), shall be Grade 40 (ksi). [Use for 17" & 21" box beams.] (11-28-2011)

Items cast into structural precast concrete to facilitate construction (forming, finishing, etc.) shall be galvanized or epoxy coated.

DRAWN BY: BLT CHECKED BY: VZ APPROVED BY: DAJ	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT INTEGRAL AND SEMI-INTEGRAL ABUTMENT BACKWALL	ISSUED: 06/17/13 SUPERSEDES: 08/15/03



PLAN NOTES:

WHERE OPTIONAL CONSTRUCTION JOINTS ARE USED, THERE WILL BE NO PAYMENT FOR THE REQUIRED JOINT WATERPROOFING.

* THE CONTRACTOR IS TO PROVIDE A SAWED JOINT [1/3 DECK SLAB THICKNESS]" DEEP BY ¼" WIDE (MINIMUM) IN THE TOP OF SLAB AT TRANSVERSE CONSTRUCTION JOINTS OVER THE BACKWALL. IF AN OPTIONAL CONSTRUCTION JOINT IS NOT USED, THE JOINT IS TO BE SAWED WITHIN 24 HOURS OF PLACING THE CURING AND IS TO BE FILLED WITH HOT-POURED JOINT SEALANT. (INCLUDED IN THE BID ITEM "SUPERSTRUCTURE CONC, FORM, FINISH, AND CURE, NIGHT CASTING (STRUCTURE NO.)").

NOTES:

INTEGRAL AND SEMI-INTERGRAL ABUTMENT BRIDGES SHALL BE CONSIDERED FOR STEEL BRIDGES LESS THAN 300' AND CONCRETE BRIDGES LESS THAN 400' IN LENGTH.

APPROACH SLAB THICKNESS WILL MATCH THE ROAD APPROACH THICKNESS (9" MIN.)

CONTINUE BOTTOM MAT OF REINFORCEMENT THROUGH CONSTRUCTION JOINT. ADD EXTRA REINFORCEMENT OVER BEAM (EA050400 BARS).

** USE FOR INTEGRAL ABUTMENT BRIDGES ONLY.

*** THE JOINT IS NOT OPTIONAL, BUT REQUIRED IF CASE I (SEE BRIDGE MANUAL 7.03.01) REQUIRES NOT BACKFILLING ABOVE THE BRIDGE SEAT.

SEMI-INTEGRAL ABUTMENTS SHOULD BE USED AT STREAM CROSSINGS.

D = BACKWALL THICKNESS. SEE GUIDE 6.20.01 FOR DEFINITION.

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