DESIGN SCENE SUBJECT INDEX

CHAPTER 1: **TITLE SHEET**
(Revised 09/10/12)

CHAPTER 2: **QUANTITIES**
(Revised 09/10/12)

CHAPTER 2: (cont.) **QUANTITIES**

- Wet Reflective/Refractive Pay Items
- Erosion Control Blanket
- Mulch Material Type 2
- Mulch Material Type 4
- Interim Pavement Marking
- Incidental and Lump Sum Items
- Alternate Bid

CHAPTER 3: **DETAILS**
(Revised 09/10/12)

- Standard Plate No. 8308A
- Safety Edge
- Approach Panel Standards-Implementation Guidelines
- Design Standards CAD Directories
- Standard Plans in CAD Directory
- Modifying Standard Drawings
- Old Details
- Reinforcement Bar Marks
- Concrete Median Islands
- Standard Plate No. 3006
- Curbs
- Unapproved Drawings
- Rumble Strip Details (at Stop Sign Locations)
- Rumble Strip/Stripe
- Concrete Joint Repair
- Standard Plate No. 4134
- Parallel Pipes and Aprons in the Median

CHAPTER 4: **EARTHWORK**
(Revised 07/01/10)

- Construction Notes
- Excess Material
- Bituminous Removal
- Check Earthwork Quantities

CHAPTER 5: **UTILITIES**
(Revised 07/01/10)

- General Information
- Mn/DOT's 15-Step Utility Coordination Process
- Abbreviated Utility Coordination Process
- Depicting Utility Facilities on Plans
- Utility Agreements and Permits Unit (Utilities Unit)

CHAPTER 6: **STAGING**
(Revised 06/20/02)

CHAPTER 7: **ALIGNMENT**
(Revised 06/20/02)

CHAPTER 8: **REMOVALS**
(Revised 07/01/10)

- Building Removals
- Remove Bituminous Shoulder
- Remove Concrete Pavement
- Remove Bituminous Pavement
- Remove Pavement

CHAPTER 9: **PLAN AND PROFILES**
(Revised 07/01/10)

- Plan Sheets
- Median Crossover/Signalized
- Special Ditch Grades

CHAPTER 10: **PAVING**
(Revised 09/10/12)

- Compaction of Bituminous Mixtures
- 2360 Plant Mixed Asphalt Pavement
- Bituminous Items in Plans
- Overlay Transition Tapers
- Concrete Pay Items
- Dowel Bar Diameter
- Joint Sealing Requirements
- Concrete Joint Pay Items
- Concrete Overlays
- Concrete Pavement Rehabilitation (CPR)

CHAPTER 11: **WALLS**
(Revised 06/27/12)

- Retaining Walls

CHAPTER 12: **DRAINAGE**
(Revised 09/10/12)

- Inplace Drainage Structures
- Drainage Flow Arrows
- Chinook Winds and Winter Snows
- Grates
- Pipe Gauges

CHAPTER 12: (cont.) **DRAINAGE**

Standard Plate 3022
Classes for Reinforced Concrete Pipe Arch
Headwalls (Polyethylene option)
Plastic Pipe Option for Storm Sewer and Side Culverts
Culvert Aprons in the Clear Zone

CHAPTER 13: **TURF ESTABLISHMENT**
(Revised 07/27/12)

Erosion Control Plans
Erosion Control Problems
Sodding Concepts
Topsoil Storage and Slope Rounding
Modified Seed Mixtures
State Seed Mixes

CHAPTER 14: **GUARD RAIL/BARRIERS**
(Revised 09/10/12)

Guardrail Terminals at 6" Curb
Impact Attenuator Barrels
Portable Precast Concrete Barrier
Guardrail End Treatments
Guardrail Replacement
Guardrail-Plate Beam Pay Items
Short Radius Guardrail
Guardrail Attachment to Barrier
Concrete End Post

CHAPTER 15: **FENCING**
(Revised 07/01/10)

Snow Fencing

CHAPTER 16: **TRAFFIC**
(Revised 09/10/12)

Interim Pavement Markings – Item 2580
Traffic Control Tabulations
Wet Reflective/Wet Recoverable Markings
Overhead Sign Numbering
Radius Corners on Type D Signs
Temporary Pedestrian Access Control

CHAPTER 17: **CROSS SECTION**
(Revised 07/01/10)

Earthwork on Cross Sections
Cross Section/Utilities

CHAPTER 18: **GENERAL NOTES**

(Revised 09/10/12)

Design Guidance and Information
Tracking Changes to Special Provisions
Proprietary Items in Plans
Definition of Install
Incidental Work vs Included in Work
Lump Sum Items
Disadvantaged Bus. Ent. & Targeted Group Business
Unacceptable Plans
Supplemental Agreements
Addendum Signature Block
Drafting Standards
Contractors Crossing of Railroads
Changing Project Scope
Municipal Agreements for State-let Projects
Road Design Plans Final Checklist
Plan Review-Bidability, Stds., & Consistency Checklist
Heads Up
Process A Plans
Design Exceptions Need to Be Documented
Plan Reduction Report (Phase 1)
Plan Reduction Report (Phase 2)
Local Federal Aid on Mn/DOT Let Projects

DESIGN SCENE/SAMPLE PLAN CROSS REFERENCE

CHAPTER	DESIGN SCENE CHAPTER TITLES	SAMPLE PLAN INDEX DESCRIPTION
1.	TITLE SHEET	TITLE SHEET GENERAL LAYOUT
2.	QUANTITIES	ESTIMATED QUANTITIES
3.	DETAILS	STANDARD PLATES
4.	EARTHWORK	EARTHWORK TABULATION AND SUMMARY SOILS AND CONSTRUCTION NOTES
2.	QUANTITIES	TABLULATIONS
5.	UTILITIES	PUBLIC UTILITIES TABULATION MUNCIPAL UTILITIES TABULATION UTILITY PLAN SHEETS
3.	DETAILS	TYPICAL SECTIONS MISCELLANEOUS DETAILS SPECIAL ENVIRONMENTAL PLAN SHEETS STANDARD PLAN SHEETS
6.	STAGING	STAGING PLAN BYPASS PLANS
7.	ALIGNMENT	ALIGNMENT PLAN AND TABULATIONS
8.	REMOVALS	INPLACE TOPOGRAPHY REMOVAL PLANS
9.	PLANS AND PROFILES	CONSTRUCTION PLANS CONSTRUCTION PLAN DETAILS PROFILES
10.	PAVING	CONCRETE PAVING PLANS CONCRETE PAVING DETAILS BITUMINOUS PAVING PLANS SUPERELEVATION PLAN
11.	WALLS	RETAINING WALL PLANS AND PROFILES RETAINING WALL DETAILS NOISE WALL PROFILES AND TABULATIONS
12.	DRAINAGE	DRAINAGE PLANS DRAINAGE PROFILES AND TABULATIONS DRAINAGE DETAILS HYDRAULIC NOTES
13.	TURF ESTABLISHMENT	EROSION CONTROL PLAN TURF ESTABLISHMENT PLANS
14.	GUARD RAIL/BARRIERS	IMPACT ATTENUATOR PLAN AND DETAILS TRAFFIC BARRIER PLANS TRAFFIC BARRIER DETAILS
15.	FENCING	FENCING PLAN
16.	TRAFFIC	TRAFFIC
17.	CROSS SECTION	CROSS SECTION
18.	GENERAL NOTES	GENERAL NOTES

CHAPTER 1: TITLE SHEET

Primary S.P. Number

The Prime S.P. number will now be shown on the Project Submittal Memo.

For many years Mn/DOT has used the Low S.P. number method to identify projects. But this sometimes resulted in the Low S.P. changing with the addition or deletion of work. This method (Prime S.P. number) will replace the current method of Low S.P. number as per technical memorandum 10-01-SCE-01 dated March 2, 2010.

Selection of the Prime S.P. number should be based on the purpose and need for the project, the main reason why this project is being undertaken. The selection of the Prime S. P. number should be based primarily on the segment of roadway most likely to remain as part of the project in case adjustments become necessary to the project termini. The Prime S.P. number is most likely to be the identifier that will show as the Letting project.

Any other S.P. numbers that are part of the overall project are identified as Associated S.P. numbers

Occasionally there are projects that are district-wide or state-wide in nature. These projects can still occur and the S.P. number used to identify them will be considered the Prime S.P. number.

If you do not know what your Prime S.P. number is you should contact your PUMA (Project Unification Management Application) Coordinator for assistance.

Reference Post Location on Construction Plans

For a number of years now, some designers have been tying our road plan stationing to reference posts on the title sheets with the length of projects tabulations. The terms “Milepoint” and mile post are outdated and are now called Reference Points and Reference Posts.

The green numbered Reference Posts are set on the roadway shoulder from road stationing and are used by Road Inventory, Traffic Engineering, Accident Data, Pavement Management, Soils and Preliminary Engineering. These Reference Posts are approximately 1 mile apart (but can be more or less than a mile apart) and allow a person to relate physical roadway features to plan or highway stationing. Our present trunk highway system has an established Reference Post system. Once set, a Reference Post stays at the same station for the life of that highway alignment. On divided highways, Reference Posts are set on the northbound or eastbound alignment, with another post at right angles on the other roadbed.

Reference points are based on reference posts. They are used to locate features between reference posts. A reference point has the format of PPP+xx.xxx where PPP is the number of the previous post and the +xx.xxx is the distance past the post to the feature of interest. If that distance becomes greater than a mile before the next post is reached, the “+” part of the reference point looks like this “+01.xxx” and so on. A reference point exactly at a reference post (i.e. mile

marker post 104) would be shown as 104+00.000 Do not write it as 104.000 as that can lead to confusion on whether it is a reference point or a true mile point.

This type of referencing allows for a maximum of 99.999 miles (160.928 km) between posts. The last digit has an accuracy of 5.28 ft. (1.609 m). Measurements are made in an increasing route mileage direction Reference Posts. For example, Reference Point 104+00.231. This Reference Point represents a point that is 0.231 miles past post number 104 (or 0.231 x 5280' = 1219.68 feet past post 104). Whenever Reference Posts are used, they should be prefixed with Reference Post, (R.P.) To prevent confusion with alignment data. In other words, Reference Post 104 is shown as: R.P. 104 = Sta. 327 + 78. Roadway stationing is shown to an even foot.

The method utilized a set of numbered reference posts (also called "mile posts") that are physically placed along a roadway. The first post (post 0) is not usually placed along the roadway but is assumed to exist at the beginning of the route. The remaining posts are numbered consecutively and are usually placed one mile apart. Any point along a roadway can be located by providing (1) a reference post number, (2) the distance from that reference post, and (3) an indication of the direction from the reference post.

Examples:

200 + 00.000 A location exactly at reference post 200.

350 + 00.500 A location half a mile from reference post 350. The location is half a mile beyond post 350 (towards the end of the route).

423 + 00.250 A location a quarter mile beyond reference post 423.

All plans should be tied to Reference Posts in addition to the traditional stationing information. The beginning and ending Reference Points shall be shown on the title sheet within the length block at a minimum and all the Reference Posts locations shall be shown on the general layout or plan sheets.

Stationing of Reference Points will be assigned by the Transportation Data & Analysis Office. On existing alignment, submit the beginning and ending stationing and the length of project. On new alignment, send a copy of alignment including stationing of corporate limits, public road, crossings and county lines. The Transportation Data & Analysis Office will make the calculations and return the Reference Points with stationing to the designer within a couple of weeks.

In the near future, we hope to update 5-292.608 in the Technical Manual to account for these Reference Posts and Reference Points.

Gravel Pit Leases

Gravel pits shown in the plans as possible sources of natural materials are causing some problems and delays in the processing of plans and special provisions for bid-letting. In many instances pits are listed in the plans with expired leases and other pits where leases are being negotiated. Gravel pits should not be shown in the plans unless there is current lease to cover the approximate contract time.

To alleviate these problems, it is suggested that the designer, six to nine months prior to the letting, notify the District R/W Engineer of the gravel pits that will be listed for the project. This would allow them time to check the lease and other necessary pit information. The designer should submit this information to the Special Provisions Engineer at the time the plan is submitted. This information should consist of the following:

1 Pit Number
2 Indicate if the pit is State owned or has an exclusive lease or nonexclusive lease.
3 Lease expiration date.
4 Current price of materials in cubic yards, cubic yards compacted volume and ton.
5 Any special conditions of the lease that may affect the contract or contractor.

All pit information should be tabulated in one of the first three (3) pages of the plan so that it won't be missed during final processing of the plans for letting.

Pit Data Sources

In the past, several projects had to be pulled from the letting because the contractor had obtained an exclusive right to the granular source. This results in unfair competition and/or high bid prices. If the designer has information or suspects that there will only be 1 source of material, he should contact the Right of Way people so the state can get a lease for the pit. The District Materials Engineer or the Aggregate Engineer should be able to assist the designer in determining if there is a chance that a contractor can tie up the only source of material.

Pit Data in Plans

Pit data should always be shown on one of the first three (3) sheet of the plans. If it is shown farther back in the plan it makes it difficult to find, and the necessary pit information may not be include in the special provisions for the project and may require an addendum to correct.

Plan Title Sheets –Index Map

There are frequent cases when even a magnifying glass is of little benefit when viewing a title sheet index map. The particular problem in mind and a way to resolve it, is well stated in the Technical Manual, Article 5-292.606 A1: "Judgment should be exercised regarding the project map size. In many cases the maps are too small in scale, while on others, too much area not related to the project is shown. By limiting the project map to the project itself and adjacent area, larger scale maps can often be utilized".

Bridge & Approach Plans

There evidently is still some understandable confusion on when bridge approach work should be included in the bridge plan and when a separate road plan should be prepared.

When bridge work is planned and there is work to be done outside the bridge structure limits, that work is to be placed into a separate road plan. This includes but is not limited to guardrail, signing, traffic control, striping, drainage, lighting, pavement, etc..

If a separate road plan is required the designer needs to request a SP number from the District Artemis Program Coordinator. The road plan is then developed as a normal plan with its own sheet numbering, title sheet, estimate, tabulations, etc..

If no work is planned outside the bridge structure limits a separate plan will not be required. When only a traffic control plan has been developed for a bridge, then these sheets should be given to bridge and they will be numbered into their plans. If striping, signing, or lighting is needed only on the bridge, those sheets can also be incorporated into the bridge plan.

Project Numbers

Project numbers should be left to a minimum on a construction plan. Designers should review their design work authorities to see if any can be dropped. Any time we have at least 2 with the same control section (such as S.P. 4911-xx) for a proposed contract, all but the low SP should be dropped. For example you have on the plan SP 4911-01, SP 4911-02, and SP 4911-03. Use only SP 4911-01 to cover all the areas for control section 4911. Construction and future record keeping for the project will be simplified.

When you have another SP on a project but it is only for ¼ mile or less section of roadway. It can be included in the main project SP number.

Project & Legislative Numbers

A frequent question on plan sheets is the need for T.H. number for identity purposes. The entire T.H. number, followed by the Legislative number, (T.H. 94-392) should only be shown in the bottom right corner on the title sheet. We encourage the T.H. number, (T.H. 94) in the lower right hand corner on all the other plan sheets, behind the S.P. number. This simply identifies the sheet better.

When there is more than one SP on the title sheet the entire T.H. number, followed by the Legislative number, (T.H. 94-392) should be shown for all SP's even if the TH and Legislative numbers are the same.

For many years Mn/DOT has used the Low S.P. number method to identify the project. Any other S.P. numbers that are part of the overall project are identified as Associated S.P. numbers. This method (Prime S.P. number) will replace the current method of Low S.P. number as stated in Technical Memorandum No. 10-01-SCE-01.

2005 Specification Book
For all projects the governing specifications should be shown as follows:
The 2005 Edition of the Minnesota Department of Transportation "Standard Specifications for Construction" shall govern.

Participation Projects
On projects where there is participation with municipalities (city, county, etc.) and different funding. The "General Layout" would be a good place to show where the splits occur if they don't show up on the title sheet. In addition the tabulations & estimate are to show the splits.

Construction Plan for…
The description of work should reflect any major work such as alternate bid: alternate bituminous or concrete surfacing, grading, bituminous and/or concrete surfacing, box culverts, ADA improvements, bridges, signals, lighting, TMS, etc. Sidewalks, drainage, turnlanes, widening, utilities, etc. should not be included in the title. The only time that signing, striping, guardrail, erosion control, drainage, etc. should be in the title would be when that is the only work being done.

Examples would be:
"Construction Plan for Grading, Bituminous Paving and Signals".
"Construction Plan for Signing"

Located on….
The description of the project location should reflect the beginning and ending location of the project. This should include the TH number, a cross road or water feature name of where the project begins and where the project ends. If there is more than one TH then more than one line of information should be included. It should not use reference points as location descriptions.

Federal Signature Block This block, usually in the right hand bottom corner of the title sheet, can now be removed. It will free up some area for our approval signatures.

Title Sheet Signature Block
Each District is responsible for reviewing their final plans prior to submittal to the Pre Letting Services Section. The title sheet shall be signed as recommending for approval by the District Materials Engineer, District Traffic Engineer and District Hydraulics Engineer when these functional groups have provided input to the design. If they have not provided input they do not need to sign the plan. In these cases remove their signature block.

Even though designers are required to sign every sheet in the plan, the signing of the title sheet is still required. If designers are interested in the most up to date title sheets, they are available

from the CAES Office Cell library. There are several examples of title sheets with signature blocks in the system. There is also one showing a state aid signature block.

The design engineers signature must include his/her printed name as required by the Minnesota Board of Architecture, Engineering, Land Surveying, Landscape Architecture, Geoscience and Interior Design (AELSLAGID). An example can be found at http://www.aelslagid.state.mn.us/stampinfo.pdf

Title Sheet Access

The title sheets can be accessed on a computer with microstation by the following address:
internal = \\costptch3smicro\data\MndotV8stds\DOT_MICRO\dgn\MnDOTStds_tsh-2005SPEC.dgn
external = http://www.dot.state.mn.us/caes/cadd/zip/mndot-cdstds-mstn.zip (zip file containing the MnDOTStds_tsh-2005SPEC.dgn file) This file includes both English and Metric title sheets for Process A and Process B plans as well as State Aid and Building Removals.

Project Contacts for Bidders

Previous plan convention suggests designers include their name and telephone number on the title sheet of the Plan. There is concern regarding bidders contacting several different sources to obtain project information during the time plans and proposals are on sale, prior to the letting date.

The District should provide the name and number of the Resident Engineer in the special provisions for bidders to contact. The designers' name, excluding telephone number, should be listed on the title sheet.

DO NOT place any names and/or phone numbers in the plan! The SWPPP sheets are the only exception to this.

Length Blocks

Each plan should contain a length block for each SP number. The length block should include the SP number and if more than one roadway applies then the TH should also be listed with the SP in parathesis.

If the roadway is divided it should include a note which states…THE PROJECT LENGTH AND DESCRIPTION ARE BASED ON XX ALIGNMENT OR ROADWAY.

It should also include all bridge lengths on the project. This does NOT include culverts. If a divided roadway it would only be the bridges on the alignment or roadway stated above.

It should include the exception length, if any. If a bridge is an exception then it should be included in both the bridge length AND the exception length.

The net length should be the difference between the gross length and the exception.

The beginning and ending reference points also need to be included at the end of the length block.

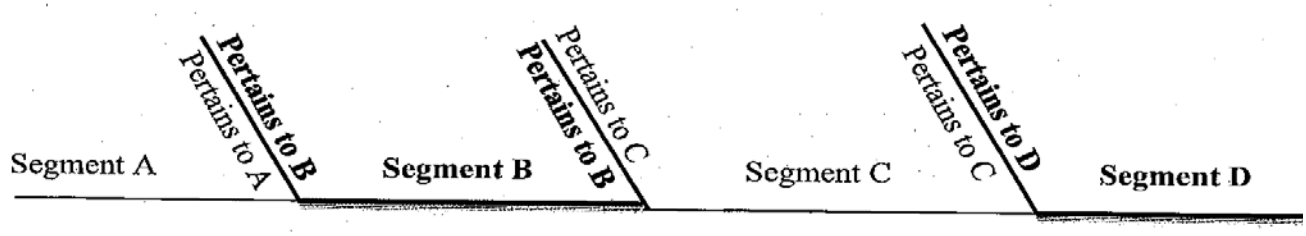
Leader Lines

There has been some confusion regarding what side of a leader line the information should be written on.

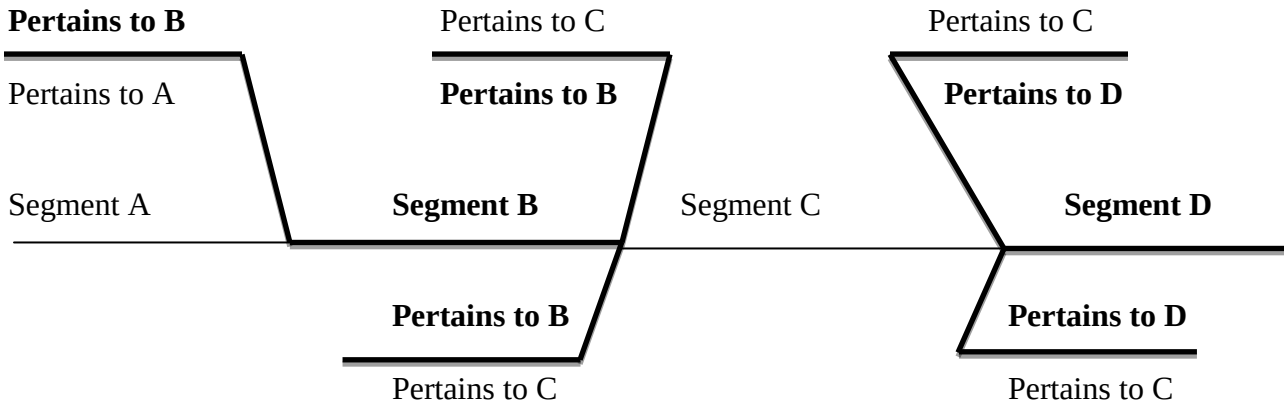
The information placed on the leader line should reference the side of the leader line that it applies to. Sometimes this may appear awkward but if you imagine the leader line as a dividing line it divides the information on either segment of the roadway.

The begin, end of an SP number and/or an exception needs to be on the correct side of the leader line. The stationing and roadway name is not as critical as it typically pertains to both sides of the leader line.

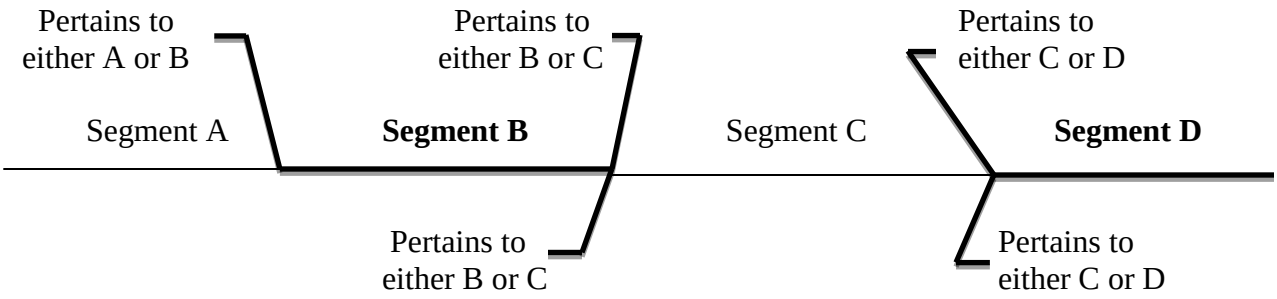
The following diagram explains it simpler terms….



A more complicated example would be…



If you are still confused by this you might think about not using the horizontal line at all as the following example shows….

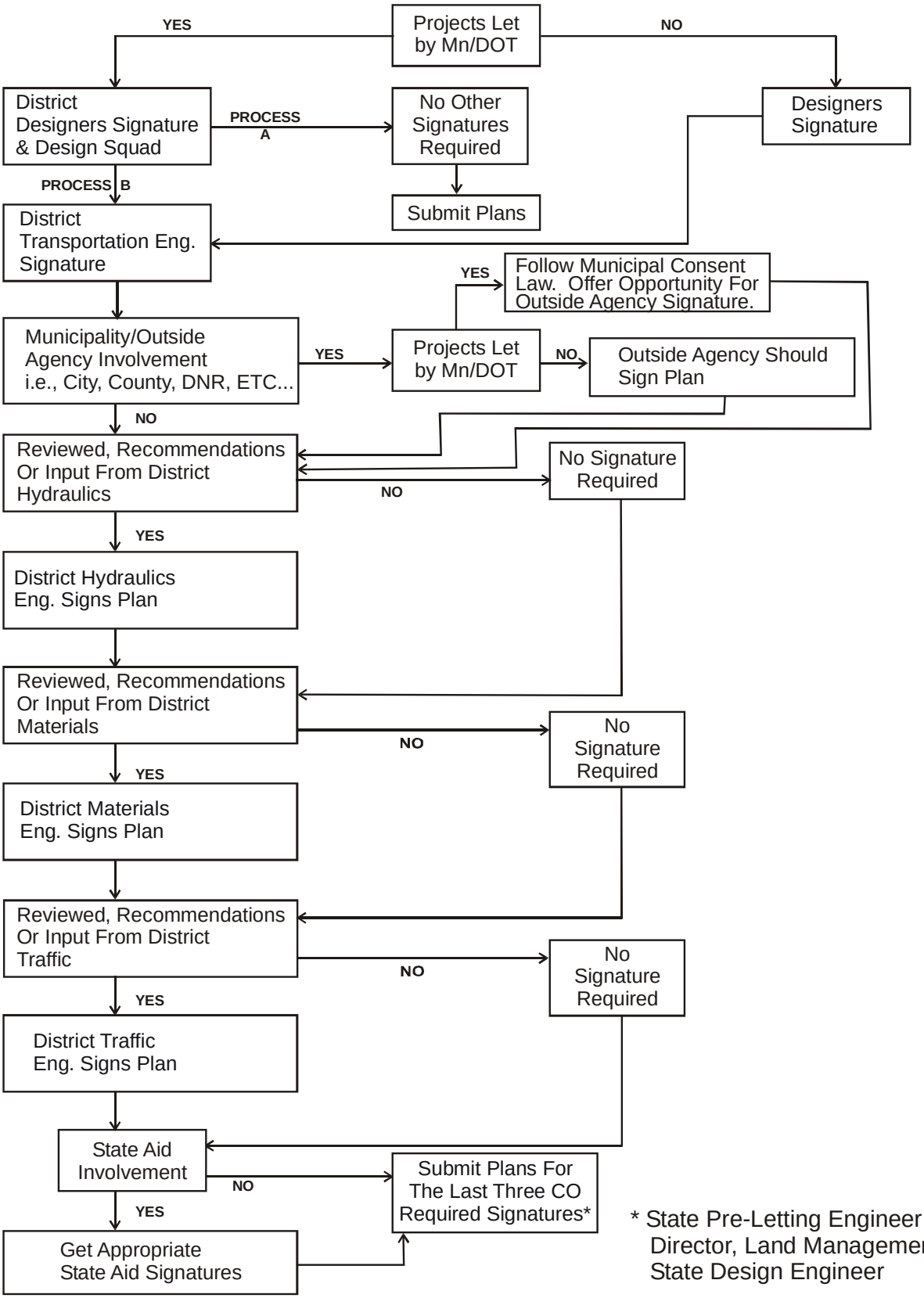


Plans Submitted for Letting –Signature Process

1 For a consultant designed plan (State Letting): the District Materials, Hydraulics or Traffic Engineer shall review and sign the plan before C.O. functional group review.
2 For agreement plans (let by others - not designed by Mn/DOT): The plan will go through the C.O. functional group review.
3 For cooperative plans (State letting): If other work is inserted into our plan, it is understood we are approving the work on Mn/DOT right-of-way.
4 For plans that have, for instance, no hydraulic considerations, their signature area can be removed.

See following flow chart:

EXISTING PROCESS
TITLE SHEET SIGNATURES
For ALL Projects With Mn/DOT T.H. Funding



* State Pre-Letting Engineer
Director, Land Management
State Design Engineer

November 18, 2004

CHAPTER 2: QUANTITIES

Estimated Quantities

The quantities put on the estimate sheet should normally be rounded to the nearest whole number. We should avoid using decimals, if possible. Only in cases of extremely small quantities should decimals be used and then only to the tenth place.

Commas should not be used either. For large numbers either leave a space where the comma would typically go or just continue the number (i.e. 12 345 or 12345 instead of 12,345).

When using small numbers as in the case of prorate items, a zero should be placed before the decimal number. (i.e. 0.5 instead of .5).

Do NOT use zero's or dashes in the estimated quantities table or any tabs. These locations should be left blank.

Tabulation Development

When tabulations are under development it is good practice to leave an open line space every 5 or 6 lines. This practice is desirable when corrections or additions have to be made on the sheets. Some designers are not leaving enough space below the tabulations for the addition of notes if some have to be added after the plan is turned in for processing. A two inch minimum space from the bottom border line of the plan sheet to the lower line on the tabulation is desirable.

Estimated Quantity Table Columns

There has been some confusion regarding the following two sections in the design scene…

Total Quantity Column

Several questions have been raised on whether the Total Quantity Column on the estimate sheet is still required. This column will not be required on the estimate sheet any longer.

Total Estimate Column

The Total Estimate Column should always follow the Unit column on the estimated quantities table. If there is more than one SP or one funding source the Total Estimate Column should come first then the low SP to the high SP.

Hopefully the following re-write will help clear up any confusion…

Estimated Quantity Table Columns

The estimated quantity table will have only one total column. It will not have a final estimate column. The Total Estimate Column should always follow the Unit column on the estimated quantities table. If there is more than one SP or one funding source the Total Estimate Column should come first then the low SP to the high SP. The following is an example of how the headings in the estimate column should be shown…

Tab	Sheet #	Item #	Item Description	Units	Total Estimated Quantity	SP Low # Quantity	SP High # Quantity

If there is only one SP then the following headings are recommended…

Tab	Sheet #	Item #	Item Description	Units	Total Estimated Quantity

The sheet # column (if used) should reference the sheet that the tab is on and/or any special details other than standard plan sheets.

Standard Abbreviations for Pay Items

The item descriptions in the estimated quantities table should follow the transport list. The list shows both a short description and a long description. The designer can use either option (i.e some items can be long description some can be short). But he/she must use the description EXACTLY as it is shown in transport.

The UNITS must also follow the standard abbreviation as follows…

METRIC	ENGLISH
Lump Sum	Lump Sum
Each	Each
m	Lin Ft
m2	Sq Yd
	Sq Yd - In
ha	Acre
L	Gallon
m3	Cu Yd
kg	Pound
t	Ton
Hour	Hour
Day	Day
Week	Week
Unit Day	Unit Day
Structure	Structure
Assembly	Assembly
System	System
Sig Sys	Sig Sys
m2/Day	Sq Ft/Day
	Sq Ft
	Road Sta

	Yard
Dollar	Dollar
	MBM (Thousand Board Feet)
	M Gallon
Tree	Tree
Shrub	Shrub
Vine	Vine
Plant	Plant

Prorata Items

There has been some confusion on which items should be prorated in construction plans which involve more than one SP. Proration distributes the cost of items such as mobilization and field office among the various funding groups and/or SP's so that they all share in the cost of these items. It should be noted that ONLY the following items should be prorated:

Mobilization	Lump sum
Field Office	Each
Field Laboratory	Each
Traffic Control	Lump Sum

As has been the practice in the past, the prorata percentage for each funding split is to be computed to two decimal places and tabulated on the estimated quantities sheet. The designer is to use estimated quantities and estimated prices to compute the prorata percentages. No other items should be taken to two decimal places.

Special circumstances may justify an exception to these procedures. These situations should be reviewed with the Municipal Agreements Unit and the Plan Review Unit, and the determination of how to handle such exceptions will be made on a case-by-case basis.

Prorata Items Involving Cooperative Construction

A sample computation of prorata items is shown below for reference.

Sample Computation
of PRORATA ITEMS
for Cooperative Construction
Agreements

Total Contract Cost =
$220,500.00

	Prorata Items
Mobilization	$10,000.00
Field Office	$ 3,000.00
Field Laboratory	$ 2,500.00
Traffic Control	$ 5,000.00

Total Cost of Prorata Items **$20,500.00**

Total Contract Cost Minus Total Cost of Prorata Items
$220,500.00 - $20,500.00 =
$200,000.00

Cost of each Funding Group
(Cost for each group does not include cost for prorata items)

Group 1:	100% State	$111,000.00
Group 2:	60% State, 40% City	$ 87,200.00
Group 3:	56% State, 44% City	$ 1,000.00
Group 4:	100% City	$ 800.00

Prorata Percentage for each Funding Group

Group 1: $\frac{\$111,000.00}{\$200,000.00} = 0.555$ (Use 0.55)

Group 2: $\frac{\$\ 87,200.00}{\$200,000.00} = 0.436$ (Use 0.44)

Group 3: $\frac{\$\ 1,000.00}{\$200,000.00} = 0.005$ (Use 0.01)

Group 4: $\frac{\$\ 800.00}{\$200,000.00} = 0.004$ (Use 0.00)

STATEMENT OF ESTIMATED QUANTITIES						
ITEM NO.	ITEM	UNITS	GROUP 1	GROUP 2	GROUP 3	GROUP 4
2021.501	MOBILIZATION	LUMP SUM	0.55	0.44	0.01	
2031.501	FIELD OFFICE, TYPE D	EACH	0.55	0.44	0.01	
2031.503	FIELD LABORATORY, TYPE D	EACH	0.55	0.44	0.01	
2563.601	TRAFFIC CONTROL	LUMP SUM	0.55	0.44	0.01	

Prorata items on Tied Plans
There has been some confusion on how to show the prorated items for tied plans. When the tied plan has the same funding for all the SP's.

			PLAN A			PLAN B			
Item No.	Description	Unit	TOTAL A	SP 1111-11	TOTAL B	SP 2222-22	SP 3333-33		
2021.501	MOBILIZATION	LUMP SUM	1	1				ACCEPTABLE	
2021.501	MOBILIZATION	LUMP SUM	1					ACCEPTABLE	
2021.501	**MOBILIZATION**	**LUMP SUM**						**ACCEPTABLE - PREFERRED**	

When the tied plan has a different funding for at least one of the SP's.

			PLAN A			PLAN B			
Item No.	Description	Unit	TOTAL A	SP 1111-11	TOTAL B	SP 2222-22	SP 3333-33		
2021.501	MOBILIZATION	LUMP SUM	0.25	0.25	0.75	0.35	0.40	ACCEPTABLE	

Plan Quantities (P)

Plan quantities may be used when the item is computable and defined in the plan by dimensions.

The use of partial plan quantity should be utilized. If it's felt that a portion of a quantity is good for plan quality, it should be shown as plan quantity with a subnote such as:

2105.501 COMMON EXCAVATION (5) Cu.Yd. (m3) 1,289,582 (985 956.4) (P)

(5) This is a partial plan quantity. The quantity is a plan quantity except for the area between Sta. 842 to 851 which shall be re-measured.

The following list is furnished as items to be considered for (P) plan quality designation. It includes 2104 "generic" items and 2232 mill bit. surface items. This is NOT meant to be a complete list. Quantities that are firm and clearly listed in the plans, consider plan quantity for them. For quantities that are Bituminous and Concrete by the SQ YD – IN or SQ YD can be a plan quantity. However, Bituminous and Concrete by the TON can NOT use plan quantities.

2101.501 Clearing
2101.506 Grubbing
2104.501 Remove___Lin. Ft.
2104.503 Remove___Sq.Ft.
2104.505 Remove___Sq.Yd.
2105.501 Common Excavation
2105.503 Rock Excavation
2105.505 Muck Excavation
2105.507 Subgrade Excavation
2105.511 Common Channel Excavation

2105.513	Rock Channel Excavation
2105.515	Unclassified Excavation
2106.607	Excavation – Common
2106.607	Excavation – Subgrade
2106.607	Excavation – Rock
2106.607	Excavation – Muck
2201.501	Concrete Base
2201.502	Concrete Base, Std. Width
2201.503	Concrete Base, Irreg. Width
2201.521	Base Reinforcement, Type____
2201.529	Reinforcement Bars (Epoxy Coated)
2211.503	Aggregate Base (CV), Class _
2211.503	Aggregate Shouldering (CV), Class _
2232.501	Mill Bituminous Surface (__")
2301.501	Concrete Pavement
2301.511	Structural Concrete
2301.513	Structural Concrete (H.E.)
2301.604	Concrete Pavement _"
2301.604	Place Concrete Pavement _"
2301.604	Place Concrete Shoulder _ "
2301.604	Irregular Concrete Pavement _"
2301.529	Reinforcement Bars (Epoxy Coated)
2301.608	Supplemental Pavement Reinforcement
2350.503	Type __#__ Course Mix (_) _" Thick
2350.504	Type _#_ Course Mix (_)
2360.503	Type _# _Course Mix (_) _" Thick
2360.504	Type _#_ Course Mix (_)
2401.501	Structure Concrete (Mix No.)
2401.511	Structure Concrete (Mix No.)
2401.521	Structure Excavation, Class
2401.539	Reinforcement Bars Delivered
2401.540	Reinforcement Bars Placed
2401.541	Reinforcement Bars
2401.541	Reinforcement Bars, Epoxy Coated
2401.542	Steel Fabric
2401.543	Spiral Reinforcement
2401.543	Spiral Reinforcement, (Epoxy Coated)
2402.583	Ornamental Metal Railing
2402.585	Pipe Railing
2411.501	Structural Concrete (Mix No.)
2411.503	Concrete (Type of Structure)
2411.511	Structure Excavation, Class
2411.521	Granular Backfill (CV)
2411.523	Aggregate Backfill (CV)
2411.541	Reinforcement Bars
2411.541	Reinforcement Bars (Epoxy Coated)

2422.501	Structure Excavation, Class
2451.501	Structure Excavation, Class
2451.503	Granular Backfill (CV)
2451.505	Aggregate Backfill (CV)
2451.507	Granular Bedding (CV)
2451.509	Aggregate Bedding (CV)
2451.511	Course Filter Aggregate (CV)
2451.513	Fine Filter Aggregate (CV)
2461.501	Concrete, Mix No.___
2461.502	Concrete, Grade
2501.501	Culvert Excavation, Class
2575.501	Seeding
2575.519	Disk Anchoring

Special Pay Item Numbers

We have standardized our special pay item numbers. All units of measure for special (ie special provisions) specification numbers shall be governed by the following list.

ALL SPECIAL PAY ITEM NUMBERS BEGIN WITH "2" NOT "0"

#	METRIC	ENGLISH
.601	Lump Sum	Lump Sum
.602	Each	Each
.603	m	Lin Ft
.604	m2	Sq Yd
.605	ha	Acre
.606	L	Gallon
.607	m3	Cu Yd
.608	kg	Pound
.609	t	Ton
.610	Hour	Hour
.611	Day	Day
.612	Week	Week
.613	Unit Day	Unit Day
.614	Structure	Structure
.615	Assembly	Assembly
.616	System	System
.617	m2/Day	Sq Ft/Day
.618		Sq Ft
.619		Road Sta
.620		Yard
.621	Dollar	Dollar
.622		MBM (Thousand Board Feet)
.623		M Gallon

Mobilization Item

The item is intended to cover the contractor's costs to mobilize labor and equipment to the project as well as other costs such as performance bond, job superintendent, testing, engineering and miscellaneous costs that have not been assigned to another bid item.

Occasionally, we see a plan without the mobilization item included. Since mobilization is a real cost to contractors, they must add their mobilization cost to the cost of another item(s). This unbalancing of bid items can distort average bid prices generated for the purpose of estimating. In the interests of providing the most accurate historical bid prices for construction, it is important to include a bid item for mobilization in our plans.

On-The Job Trainees

A project must meet the following requirements to be eligible for on-the-job trainees:

1) Federal Funds
2) Project estimate of approximately $1,000,000
3) Completion of 100 working days or more

With this information, a breakdown of the different types of work to be performed, and the location of the project, Mn/DOT's EEO Contract Management Office will determine how many trainees will be assigned to the project.

The pay item 2041.610 TRAINEES by the HOUR will no longer be shown on the statement of estimated quantities on the plans. This is a fixed price item and therefore is not a bidding item. The designer still needs to supply the Special provisions unit with a timeline so that they can include the trainee information in the special provisions as it will be a contract requirement.

Combination Field Laboratory Office

When ever this item is used in the plan it needs to include a note in the estimated quantity table…REQUIRES TYPE ??? SERVICE.

Maintenance and Restoration of Haul Roads

On large projects there is the potential for damage and/or dirt/gravel to affect the haul roads. Therefore, the item for Maintenance and Restoration of Haul Roads should be added to the plan.

Haul Salvaged Material

Our specification (Spec. 2104 and 2442) spell out that salvaged materials will be neatly stored within the project limits. The F.H.W.A. won't pay to haul salvaged materials off the construction project. If Maintenance prefers not to handle the material, the item 2104.601 Haul Salvaged Material by the Lump Sum should be added and is state funded.

Bridge Approach Treatments

A reminder to designers that we should pay for the select granular material used for bridge approach treatments as detailed and noted on the standard plan sheets. This material is paid for as:

2105.522 SELECT GRANULAR BORROW ( ) CU YD and
2105.522 SELECT GRANULAR BORROW MOD 10%( ) CU YD
( ) = LV, CV, or EV

If the modified borrow is used it should be noted in the estimated quantities what the modification consists of.

Pay Items for Safety Grates

With the 2005 Standard Specification for construction, payment for light duty and safety grates will be made under a special pay item number.

Pay items should now be:

2501.602 LIGHT DUTY SAFETY GRATE FOR __" (___ mm) (1) APRON ..... Each
2501.602 SAFETY GRATE FOR __" (___ mm) (1) APRON..... Each

(1) Specific Kind---See 2501.2

Trash guards will remain under 2501.602

Plastic Pipe Options for Culverts

Plastic pipes may be used for centerline culverts as long as they meet the following requirements…

The maximum allowable diameter is 48” (1200 mm) for use under unpaved roads or when ADT is less than 3000.

Centerline culverts shall have silt-tight joints unless designated as requiring watertight joints. A note should be in the plan when a watertight joint is required.

In order to make it clear which pipes shall have options, the allowable options shall be noted in the drainage tabulation for each reach of pipe. On the Statement of Estimated Quantities, the listed pay item will be reinforced concrete pipe. A note shall be provided on each appropriate pay item noting that plastic pipe may be used as an option.

ADA Pay Items

The ADA group has set up a location for their project design guide, provisions, pay items and other useful information which can be found on ProjectWise at…

pw:\\PW8i.ad.dot.state.mn.us:cadp\Documents\Operations\ADA-Review\ADA_Provisions\ADA Pay Item Guidance.xlsx

They have also established a new webpage which can be found at MnDOT A to Z under **ADA Design and Construction Tools…**
http://www.dot.state.mn.us/ada/tools.html

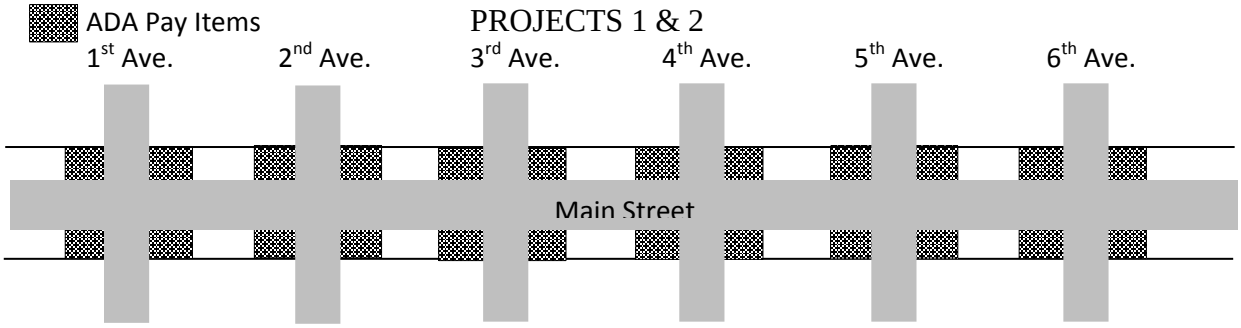
All designers should follow the design guide when working on ADA Improvements. ADA Project Design Guide (version 2).docx This link is presently only available to internal users. External users will need to get the information from the MnDOT project manager.

The details are now approved standard plan sheets which can be found in the standard plan sheet website under standard plan 5-297.250 (1 thru 5).

There has been some confusion on when to use the new ADA pay items and when to use the traditional pay items. The following are basic guidelines on which pay items should be used for which situations….

Project 1 – Standalone Curb Ramp Replacement Project or Standalone Signal Installation/Replacement

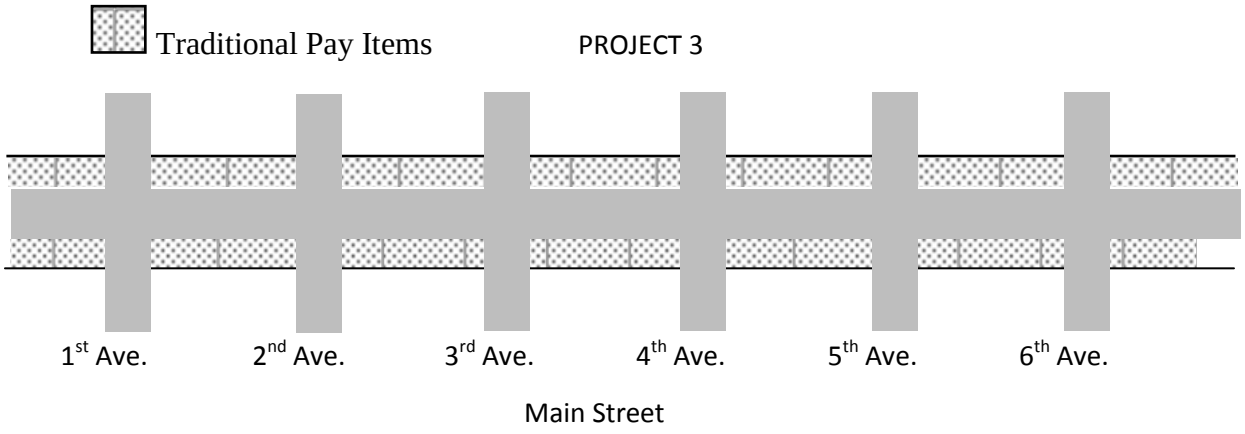
- These projects would only use new ADA pay items for roadway/curb ramp work



Project 2 – Mill & Overlay with Curb Ramp Replacements

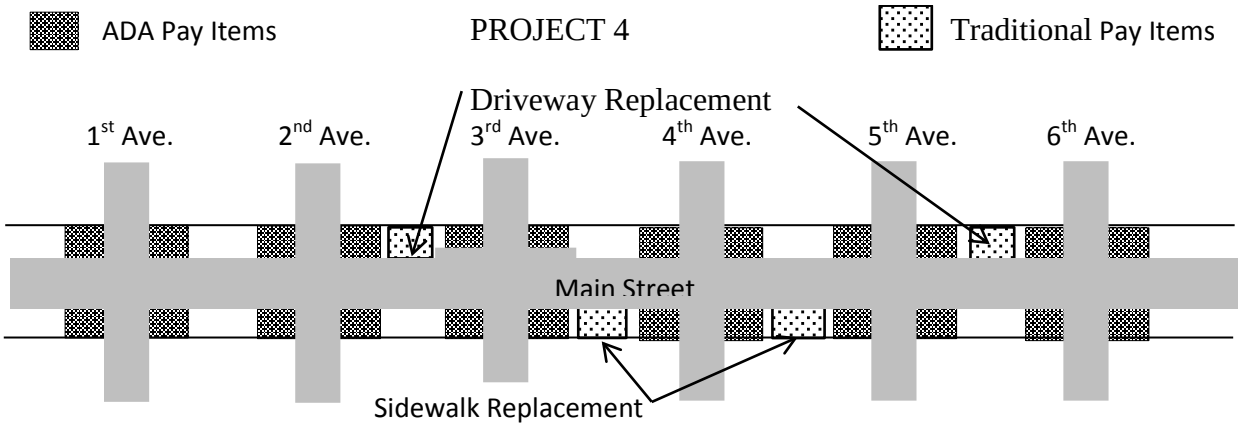
- These projects would use ADA pay items for curb ramp work (Concrete Walk, Concrete Curb & Gutter, Site Restoration). Traditional pay items would be used for roadway work unless there are areas with curb ramp replacements beyond the mill & overlay limits, in which case the ADA items for bituminous pavement could be used for bit. removal and replacement in those areas.

<u>Project 3</u> – Reconstruction/Regrade
Project is a roadway reconstruction project including replacement of sidewalk, signals, etc. Use all traditional pay items, no incidentals.



<u>Project 4</u> – Mill & Overlay with Curb Ramp, Driveway, and Sidewalk Replacements
Project is a mill and overlay with curb ramp replacements and replacement of sections of sidewalk and some driveways.

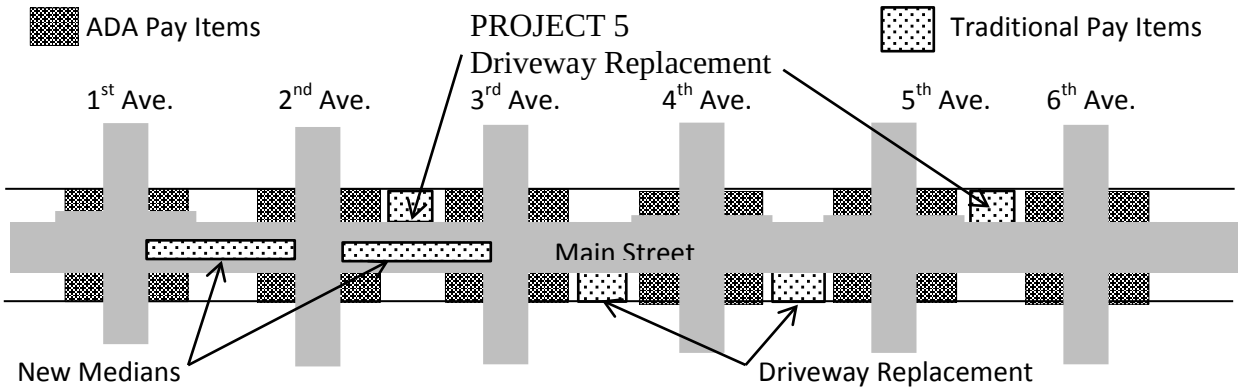
- Sidewalk and driveway replacements would be paid for using traditional pay items.
- Curb ramp replacements would be paid for using ADA pay items.



<u>Project 5</u> – Access Management Project, Mill & Overlay, Median Installations, Driveway Replacements, and Curb Ramp Replacements
Project is an access management project, which includes mill and overlay, installation of concrete medians, removal of some driveways and replacements of others, curb ramp replacements and APS signal upgrades.

- Installation of medians and driveway replacements would be paid for using traditional pay items.
- Curb ramp replacements would be paid for using ADA pay items.

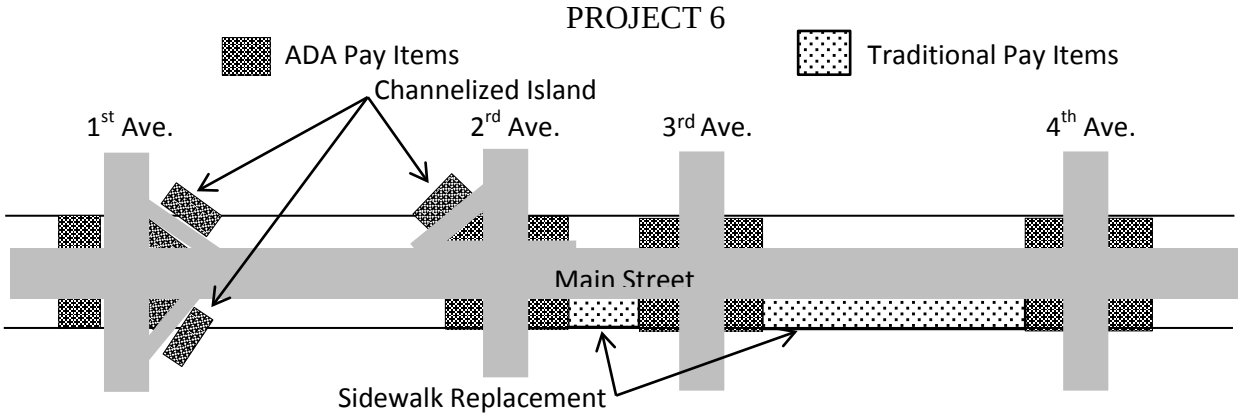
- If project was replacing all of the sidewalk, only traditional pay items would be used, no ADA pay
  items.



<u>Project 6</u> – Mill & Overlay, Sidewalk Additions, Replacement of Channelization Islands and Curb Ramps

Project is a mill and overlay with ADA Improvements including porkchop channelization island replacements, curb ramps, and signal upgrades to APS. Project also adds 2 blocks of new sidewalk along the highway.

- Two blocks of new sidewalk would be paid for using traditional pay items. Sidewalks would be 4" concrete walk. Curb Ramps for the new sidewalk would be paid for using the ADA Concrete Walk pay item.
- All curb and gutter, pork chop island replacements, median modifications, and curb ramps would be paid for using ADA pay items: Concrete Walk and Concrete Curb & Gutter with aggregate base and earthwork incidental. Turf establishment and side grading would be paid for using Site Restoration pay item.



<u>Project 7</u> – Full Regrade and Mill & Overlay with Curb Ramps

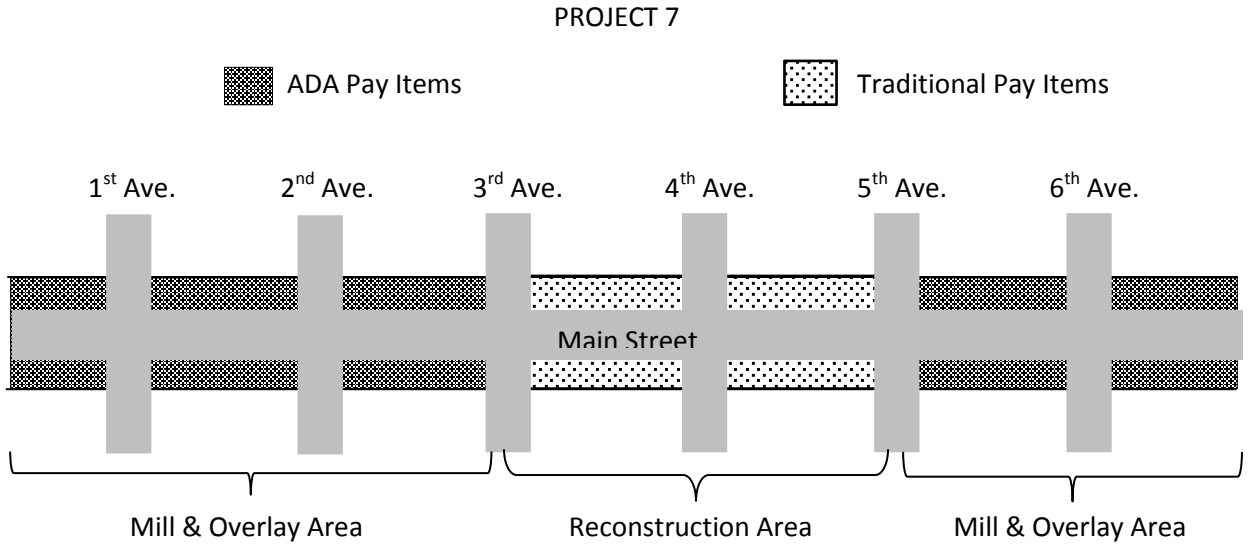
Half of the project is highway reconstruction with a subcut including new sidewalks, drainage, lighting, signals, etc.

- On this portion of the project, traditional pay items would be used. Sidewalks would be 4" concrete walk and curb ramps would be 6" concrete walk. Aggregate Base, Earthwork, and Turf Establishment would all have traditional pay items. Curb and gutter payment would be paid for by the type. (B624, etc.)

The other half of the project is a mill and overlay with ADA Improvements including curb ramp replacements and APS signal upgrades.

- On this portion of the project, curb ramp replacements and curb and gutter at curb ramps would be paid for using ADA pay items: Concrete Walk and Concrete Curb & Gutter. Aggregate Base and any earthwork is incidental. Side grading and turf establishment would be paid for using Site Restoration pay item by the EACH. Ideally each site's grading limits would not touch so the limits of each site can be clearly defined.

Clarification: Curb ramp replacement includes all of the walk area necessary to meet existing walk grades, including any transition panels.
Curb Line Changes: In areas where curb lines are moving more than 2 feet, traditional pay items should be used for roadway pavement removal and replacement. ADA pay items would be used for concrete walk and concrete curb & gutter.



The following are the ADA pay items as mentioned in the examples above….

- 2104.501 REMOVE CURB AND GUTTER by LIN FT…note that sawcuts are incidental.
- 2104.503 REMOVE CONCRETE WALK by SQ FT…note that sawcuts are incidental.
- 2104.603 REMOVE AND REPLACE BITUMINOUS PAVEMENT by LIN FT…for bit in poor condition.

- 2232.603 MILL AND PATCH BITUMINOUS PAVEMENT by LIN FT...for bit in good condition
- 2521.618 CONCRETE WALK by SQ FT
- 2531.603 CONCRETE CURB & GUTTER by LIN FT
- 2531.603 CONCRETE CURB DESIGN V by LIN FT
- 2531.618 TRUNCATED DOMES by SQ FT
- 2575.602 SITE RESTORATION by EACH

Measurement of Concrete Median Barrier Design 8334 Type AA

Concrete median barrier (design 8334) should be measured and paid for separately by type. Type A, Type AL and Type transition barrier lengths are measured along the top of the barrier, essentially one foot of barrier for each foot of median. Type AA barrier is also measured along the top of the barrier but each side is measured separately.

Raised Pavement Markers Temporary

When including temporary raised pavement markers in the plan, show only one pay item. "Raised Pavement Markers Temporary" - and add footnote to the item indicating how many are one-way, two-way, and what color. We have a specification to attach to the proposal that only includes this pay item. (There is very little difference in cost for the different types.)

Traffic Control- Tabulation

Traffic control items that are included with the lump sum should not show quantities on the tabulation. This information will be supplied in the current tabulated or listed format via a stand alone document to the Cost Estimating Engineer and the Design Support Engineer only, at the time of project submittal. The Preliminary Estimate and Data Base file (*.mdb) will be located in the specific projects ProjectWise location (a right protected folder), with AD group name of "DxEstimates" and a Folder name of "Estimates_Restricted" which restricts access for anyone except newly established AD group (Ex. Design Engineer, Lead Designer & District Cost Estimating Engineer).

However, the items which are paid for separately (not part of the lump sum) should be shown as a tabulation for traffic control and noted as being paid for separately. Items such as, but not limited to …

2533.507 Portable Precast Conc Barrier Des 8337
2563.602 Tube Delineator
2563.xxx Portable Changeable Message Sign
2563.602 Raised Pavement Marker Temporary

Wet Reflective/Refractive Pay Items

There has been a request to have specific pay items for the wet reflective/refractive pay items so that they can track where these items are used and to obtain historical price data on them.

Therefore, when the plan contains wet reflective/refractive pay items the following should be used on the Statement of Estimated Quantities….

2582.602 PAVT MSSG *(usual striping pay item description)*PAINT (WR) by EACH
2582.602 PAVT MSSG *(usual striping pay item description)*EPOXY (WR) by EACH
2582.603 *(usual striping pay item listing size, style, color)* - EPOXY (WR) by LIN FT
2582.603 *(usual striping pay item listing size, style, color)* –PAINT (WR) by LIN FT
2582.618 CROSSWALK MARKING – PAINT (WR) by SQ FT
2582.618 CROSSWALK MARKING – EPOXY (WR) by SQ FT

These liquid wet reflective or wet refractive items are required to be ground-in per Technical Memorandum No. 08-10-T-02. It is suggested that you note on the SEQ or tab if they are NOT ground-in.

For the temporary wet reflective/refractive markings the standard pay items will continue to be used.

Permanent wet reflective/refractive Poly-Preform tape is presently NOT allowed on MnDOT projects.

Erosion Control Blanket

In the 2005 spec. book the erosion control blanket pay item has a note (1) that indicates that the item description should include maintenance.

The intent of the specifications was to include maintenance as a subnote shown on the estimate of quantities sheet rather than as part of the pay item description.

Mulch Material Type 2

This is paid for as 2357 Bituminous Material for Shoulder Tack

Mulch Material Type 4

As stated in the Spec book we do not pay for this as Type 4 but rather as two separate pay items…
2575 Mulch Material Type 1 @ 1.5 tons/acre, and
2575 Type 5 Hydraulic Soil Stabilizer @ 750 lbs/acre

Interim Pavement Marking

The interim pavement marking detail needs to be included in the plan whenever this pay item is used. The estimated quantities table will also need to include a note breaking out the markings (i.e. solid, broken, white, yellow, etc.) if paid for by the Lin Ft in the plan.

Incidental and Lump Sum Items

An internal review of our existing process for the development of engineer's estimates for construction projects identified a number of risk areas and change needs. The following process changes will be made immediately. These adjustments to our process will result in reducing the risk of inadvertent disclosure of nonpublic data prior to project award per Minnesota Statute §13.72, subd. 1.

These new procedures will be applied to all projects that are included in the Mn/DOT letting process.

The INCIDENTAL, FOR INFORMATION ONLY, and LUMP SUM quantities will no longer be supplied in the plan or special provisions. The list of elements and application rates included in the incidental and lump sum items can be listed in the plan and special provisions but not the quantities.

FOR INFORMATION ONLY statement as associated with quantities will no longer be allowed in the plans.

This information will be supplied in the current tabulated or listed format via a stand alone document to the Cost Estimating Engineer and the Design Support Engineer only, at the time of project submittal. The Preliminary Estimate and Data Base file (*.mdb) will be located in the specific projects ProjectWise location (a right protected folder), with AD group name of "DxEstimates" and a Folder name of "Estimates_Restricted" which restricts access for anyone except newly established AD group (Ex. Design Engineer, Lead Designer & District Cost Estimating Engineer).

Alternate Bid

The Minnesota Department of Transportation (MnDOT) has made a decision to develop alternate bid pavement plans for rehabilitation projects that fall within a certain threshold. See the letter from the Office of Materials and Road Research dated September 1, 2011 at… http://www.dot.state.mn.us/materials/pvmtdesign/docs/Fiinal_Alternative_Bid_Directions_09_01_11.pdf

These alternate bid pavement plans will allow certain rehabilitation projects to be bid by both bituminous and concrete contractors.

A committee was formed to formulate the following guidelines for alternate bid projects….

General Themes

As the committee discussed the sections of the plan two thoughts became prominent. The first was that as much of the plan as possible should be common to both alternates. Having as much of the plan as possible common to both alternates should keep the plan size reduced to nearly the same size as a single alternate rehabilitation project.

The second thought was that all information relating to alternates should be clearly and consistently labeled to provide a contractor as much clarity as possible in distinguishing between alternates. The committee selected to label alternates using numbers rather than letters for statewide consistency. The alternate number should be followed by a description of the alternate. An example would be "**Alternate 1 – Reclamation and Bituminous Surfacing, Alternate 2 – Concrete Overlay**". This labeling should be used consistently throughout the plan wherever alternate paving information is shown.

Recommendations for Plan Format

Title Sheet

The title on the title sheet should clearly state that the plan is an alternate pavement plan, i.e.: CONSTRUCTION PLAN FOR Grading, Alternate Bituminous or Concrete Surfacing, etc

Statement of Estimated Quantities

Pay for the bituminous quantities by the ton and pay for concrete with two items, Sq Yd for Place Concrete Material and cubic yard for the structural concrete. This is consistent with the September 1, 2011 letter from the Office of Materials and Road Research.

1) The alternate bid quantities should be part of the main SEQ and not in separate SEQs. The alternate bid quantities should be at the end of the SEQ. The alternates should be slightly separated from the other items in the SEQ and clearly labeled as discussed under General Themes section of this report. Only those items directly related to the alternate pavement design should be listed in the alternate sections of the SEQ. In some cases, there may be items such as striping listed in the alternate sections because those items change with the pavement selected.

2) In the case where the milling depth or the reclaim depth may vary between alternates, the removal quantities that the alternates have in common should be shown in the common section of the estimated quantities. For the alternate that requires the removal of extra material, only the quantity of extra material should be shown in the alternate quantity.

General Layout and Construction Plan Sheets

For most rural plans, a General Layout should be sufficient to convey the anticipated construction. Plan details can be added later in the plan to show information that may be required for culvert replacement, superelevation transitions, etc.

1) Construction Plans sheets may be needed if a rural project involves inslope grading over the length of the project due to crown or superelevation correction. In these cases, erosion control, turf establishment, culvert adjustments, etc. may need to be shown on a more detailed Construction Plan type sheet. As much information as possible should be shown on one sheet to minimize the size of the plan set.

2) For urban projects, Construction Plan sheets may be necessary to show locations of storm sewer facilities, ADA improvements, etc.

Profiles
Profiles are generally not needed unless there are intentional corrections to the profile to correct sight distance or bridge clearance.

Typical Sections
Use common typical sections where possible for existing typical and perhaps the milling and/or reclaiming.

1) Clearly label typical sections for alternates with the convention listed under the General Themes section of this report.

2) Each alternate should have its own typical section(s). Do not split a typical section between alternates (show the bituminous alternate left of centerline and the concrete alternate right of centerline).

As per the September 1, 2011 letter from the Office of Materials and Road Research, the pavement widths should be the same if possible. Pavement widths may not be 26 feet, however, due to the width of the underlying pavements upon which the new surface will be constructed.

Tabulated Quantities and Construction Notes
Most tabulated quantities and construction notes should be common to both alternatives. Tabulated quantities and construction notes that pertain to only one alternate should be clearly labeled as described in the General Themes section of this report.

Traffic Control
1) Alternate bid plans requiring reclaiming will typically require a detour for both alternates. The same detour should be used.

2) Alternate bid plans requiring milling may only require a detour for the concrete paving since the bituminous overlay could typically be done under traffic. In the case of milling type projects, several options could be considered by the District:
    a. Require the bituminous contractor use the same detour as the concrete contractor. This would keep consistency between the options and would allow the bituminous contractor the same unobstructed work site as the concrete contractor. If bridge or culvert replacement is part of a project, this may be the natural course of action. Depending upon the length of detour and business impacts, this option may not be desirable from the public's perspective.
    b. Require the bituminous contractor to work under traffic. This could require the traffic control to be considered as part of the alternate bid portion of the estimated quantities since it would be drastically different for the two alternatives. This option could be more desirable from a road user and business perspective. However, the bituminous contractor is not allowed the same unobstructed work site as the concrete contractor and heavy traffic volumes may reduce production rates or require night work.

c. Design the same detour plan for both options, but allow contractors to work under traffic if they desire. Contractors choosing to work under traffic could not submit the proposal under value engineering. A more formalized way to deal with this option, however, would be to set up an A+B contract where the B portion is determined by the number of days that the contractor would use the detour. This would allow the contractors the greatest flexibility, but would not necessarily be the best way to address user costs and business impacts.

3) The decision on Traffic Control for mill and overlay type projects will need to be addressed on a case by case basis considering other work types in the project that may require a detour, traffic volumes that may hinder productivity, business impacts, and available and reasonable detour routes.

Cross-sections

With many rehabilitation projects, cross-sections will not be needed as part of the plan set.

1) Some rehabilitation projects may require minor inslope work. The inslope work may not be readily visible on cross-sections drawn for the plan. In these cases, the cross-sections may be omitted from the plan, even though they may need to be developed to calculate quantities.

Other Issues

Other issues affecting project delivery were also discussed.

1) The designer should request a life cycle cost from the pavement engineer at the time of plan turn in. This will allow the pavement engineer sufficient time to develop the life cycle cost adjustment factor for the bidding process.

2) A standard specification for pavement smoothness has been developed for alternate pavement projects. This specification should be incorporated into the special provisions.

3) Alternate bid projects should not be combined with single alternate projects. These combinations could skew the bid of the alternate pavement to the pavement type selected for the other portion of the project.

4) Alternate bid projects should not be combined with other alternate bid projects. If a District desires to combine two alternate bid projects, the District should work with the pavement engineer to see if common typical sections and life cycle costs can be used over the length of both projects.

5) Districts may use A+B bidding in conjunction with alternate pavements. A+B contracts may be desirable when a significant difference in working days between alternates is anticipated.

Use 2301.604 “Concrete Pavement __” ” by the SQ YD (m2) pay item when 2360 pay items are Square Yard. Use 2301.604 “Place Concrete Pavement __” ” by the SQ YD (m2) and 2301. 51X “Structural Concrete” by CU YD (m3) pay items when 2360 pay items are Tons.

CHAPTER 3: DETAILS

Standard Plate 8308A
Whenever the standard plate 8308A is used it must include the following note…

Modified such that note 1 of sheet 2 of 3 should delete…OPEN JOINTS SHALL BE PROVIDED AT LEAST EVERY 200 FEET.

Safety Edge
Technical Memorandum NO. 11-01-T-01 dated January 19, 2011 states that ALL Mn/DOT projects let on or after July 1, 2011 will have to include a safety edge if it meets the requirements as outlined in the Technical Memorandum (under guidelines).

Construction of a Safety Edge at the edge of the paved surface significantly reduces the potential of "tire scrubbing" and minimizing the consequences of drifting off the pavement surface.

The safety edge construction is done by shaping the edge of the pavement material with a 30-degree slope during the paving process (measured from the pavement/shoulder cross slope plane).

1. Safety Edge is required along bituminous pavement edges on projects where all of the following are true:

- New bituminous pavement/shoulder or bituminous overlay is being constructed with at least 2 (two) inches of paving depth.
- Paved shoulders are 6 (six) feet or less in width. (Safety Edge is optional on wider shoulders.)
- Pavement/shoulders do not have curbing.
- Safety edge will be optional for concrete shoulders.
- Safety Edge is required on Maintenance/Repair projects where it has previously been incorporated into the pavement/shoulders.
- Safety Edge requirements will not apply to preventive maintenance type projects; chip seals, crack sealing, slurry sealing, etc., with less than 2 inches of thickness.

For divided highways, the safety edge must be added to both median and outside bituminous shoulders when the paved shoulder width is 6 feet or narrower and the travel lanes are also bituminous. On concrete divided highways with bituminous shoulders, the median shoulder safety edge will be optional.

The safety edge must be constructed as an integral operation of the roadway pavement placement process.

The installation of the safety edge in limited clear zone areas or in front of guardrails is optional if the designer concludes that it interferes with operational aspects or is too onerous to construct. The decision must be documented in the permanent project file.

During construction, a 2-4 inch depth of non-bituminous shoulder material adjacent to the pavement edge may be removed prior to installing the safety edge to allow for a thicker edge section.

Bituminous pavement safety edges are easily constructed with the use of a manufactured shoe device, which attaches to the screed of the paving machine. The device uses a spring-loaded shoe that constrains the asphalt head, thus increasing the density of the extruded edge profile. The shoe is capable of applying variable pressure to ensure some compaction of the edge during paving operation. **Make sure that the plan/special provisions includes language requiring this method of installation.**

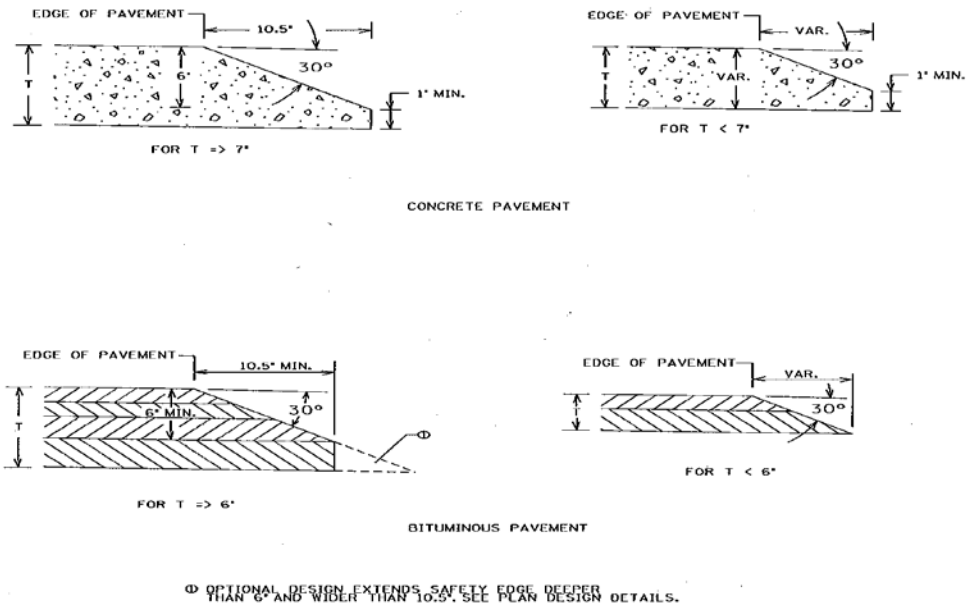
A single-plate strike-off method is **not allowed** for bituminous paving, as the single-plate strike-off method has been found to produce a non-durable edge.

District Materials input must be solicited on each project where safety edges are to be installed. In certain cases, additional subgrade support may be needed to support the installation of the safety edge.

For information on the technical content of this Technical Memorandum, please contact the **State Traffic Safety Engineer.**

Payment for the Safety Edge will be included in the Roadway Bituminous quantities.

The following details (as taken from Technical Memorandum NO. 11-01-T-01 dated January 19, 2011) should be included in either the detail sheets or as a detail on the typical sheets….



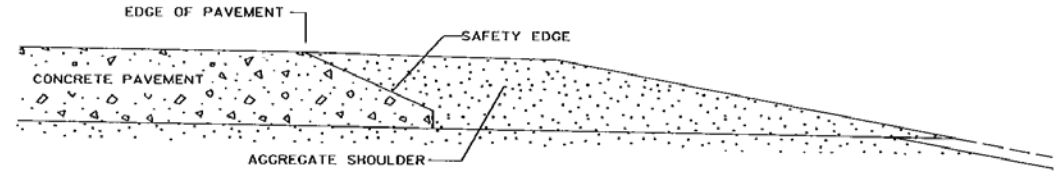


FIGURE A
CONCRETE PAVEMENT

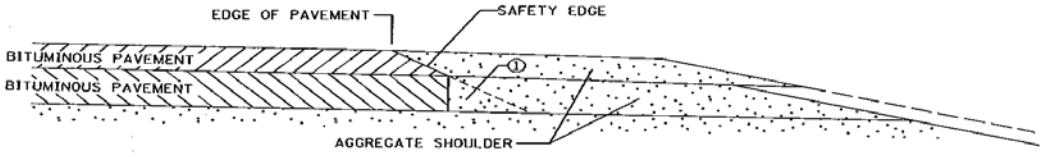


FIGURE B
BITUMINOUS PAVEMENT

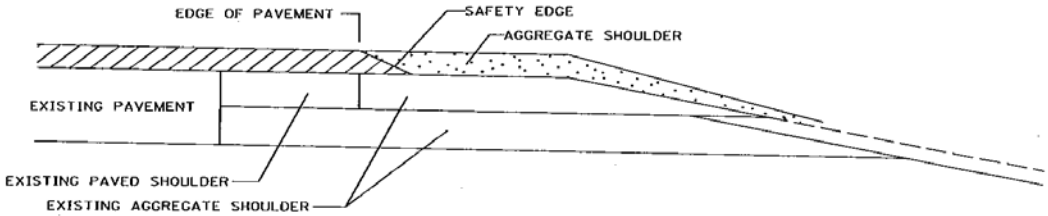


FIGURE C
BITUMINOUS OVERLAY

① OPTIONAL DESIGN EXTENDS SAFETY EDGE DEEPER THAN 6" AND WIDER THAN 10.5". SEE PLAN DESIGN DETAILS.

APPROACH PANEL STANDARDS - IMPLEMENTATION GUIDELINES

The approach panel standard sheets have been revised and updated. The old standard sheets will be archived and replaced by new standard sheets. Many details have been rearranged and expanded so that the information needed for construction is more complete. There are eight new standard sheets, with each sheet containing a particular set of details. A typical bridge will require six standard approach panel sheets, the first two sheets will vary depending on the approach barrier configuration (see below), the other four sheets will be typical for all approach panel configurations. A description of each of the standard approach panel sheets follows:

Geometry & Reinforcing Details

Depending on the approach barrier configuration, use one of the following 2 alternates to select the first two sheets of approach panel standards for a particular bridge (check with the bridge designer if necessary);

ALTERNATE A - Use the following 2 sheets for bridges where the concrete barrier off the end of the bridge is mounted on a wingwall (typical of past bridge designs);

1) 5-297.222 Geometry - - This sheet contains the approach panel layout information. This is project/bridge specific information showing the skew, stationing and elevation of key panel points. The type of joint at the end of the panel is indicated on this sheet. This sheet along with sheet 5-297.223 should be used when the concrete barrier is mounted on a wingwall.

2) 5-297.223 Reinforcing Details - - This sheets shows the details for the steel reinforcing bars, including plan views and cross section views indicating the size and spacing of the reinforcement in the panel. The new standards now include a bar mark (i.e. AP1302E) for each reinforcing bar. A blank *Bill of Reinforcement* is provided for the contractor/fabricator to complete, to be submitted along shop drawings for each panel.

ALTERNATE B - Use the following 2 sheets for bridges where the concrete barrier off the end of the bridge is mounted on the approach panel (This is a new construction detail and is expected to be used very often in the future).

1) 5-297.224 Geometry - - This sheet contains the approach panel layout information. This is project/bridge specific information showing the skew, stationing and elevation of key panel points. The type of joint at the end of the panel is also indicated on this sheet. This sheet along with sheet 5-297.225 should be used on bridges where the concrete barrier is mounted on the approach panel. To accommodate guardrail connection and crash test requirements the concrete barrier must extend 5'-0" minimum onto the approach panel. For wingwalls that are parallel to the roadway centerline the barrier must extend 5'-0" minimum onto the approach panel or to the end of the wingwall, whichever is longer. Barrier reinforcement and payment will be included in the bridge plan.

2) 5-297.225 Reinforcing Details - - This sheets shows the details for the steel reinforcing bars, including plan views and cross section views indicating the size and spacing of the reinforcement in the panel. The new standards now include a bar mark (i.e. AP1302E) for each reinforcing bar. A blank *Bill of Reinforcement* is provided for the contractor/fabricator to complete, to be submitted along shop drawings for each panel.

Other Approach Panel Standard Sheets

1) 5-297.227 Miscellaneous Details - - This sheet includes the details and reinforcement for the sill at the end of the approach panel and the curb transition details. Blank *Bill of Reinforcement* tables are provided for the contractor/fabricator to complete, to be submitted along with shop drawings for each panel.

2) 5-297.228 Joint Layout - - This sheet indicates the joint locations and types for all of the longitudinal and transverse joints on the approach panel and is intended to be customized by the grading/roadway designer to include the unique features (skew, length, etc.) of each approach panel. The Concrete Engineering Unit at the Maplewood Lab can be contacted for assistance with joint layouts.

3) 5-297.229 Joint Details - - This sheet provides the sawing, sealing, and other requirements for the joints indicated on sheet 5-297.228 and details regarding sidewalk (if present) cover plates.

4) 5-297.231 Drainage Details - - The location of pipe drains and catch basins are included on this sheet. In the future a sheet with details for a drainage flume (in lieu of a catch basin) will be added.

Road Designer Responsibilities:

1) Select the first two standard sheets (Either Alternate A or Alternate B). The choice depends on the location of the concrete barrier and whether it is attached to the approach panel or to the bridge abutment wingwall. The Bridge Preliminary Plan will indicate which detail should be used. The Bridge Office will provide assistance on the selection if needed.

   Include either 5-297.222 & 5-297.223 (Alternate A) or 5-297.224 & 5-297.225 (Alternate Option B)
   a) Choose the correct panel plan view based on the skew of approach panel. Cross out the unneeded view. The approach panel plan view should be modified/mirrored to show the actual skew orientation, wingwall and curb transition configuration, and traffic direction arrows. Fill in the proposed skew angle (where needed).
   b) Fill in all data for proposed stations and elevations. Contact the Bridge Office for stations and elevations at the end of the bridge.
   c) Fill in the proposed expansion joint type (E8H, or None). Contact the Bridge Office for the appropriate type, which will generally be E8H for trunk highway bridges and "None" for low volume local roads. Details of the E8H expansion joint are shown on sheet 5-297.227 and 5-297.229.
   d) Note that the Contractor is directed to provide shop drawings for the reinforcing layout and a completed *Bill of Reinforcement* table. The Contractor is to send this information to the Project Engineer at least 3 weeks prior to rebar fabrication. The Bridge Office Construction Unit will provide help on reviewing the shop drawings if necessary.

2) Work with the Concrete Engineering Unit to determine the location and type of all joints on the approach panel and complete standard sheet 5-297.228. Sheet 5-297.229 should also be included as it provides additional joint details.

3) Complete standard sheet 5-297.227 by verifying the proposed curb transition lengths and details. Also, in the lower left corner of the sheet, based on the type of joint at the end of the approach panel, cross out the details that do not apply. Note that one end of the panel rests on a concrete sill and is NOT to be tied or doweled to the concrete approach panel in order to allow the approach panel to slide to accommodate the temperature movement of the bridge. The sill is placed under the lanes, shoulders and curbs. When approach panels

abut concrete pavement, the concrete pavement (not the approach panel) is rigidly tied to the sill.
Previously, concrete lugs were provided under the concrete approach panel. They have since been removed from under the approach panel and are now located under the first concrete pavement panel beyond the sill (away from the bridge). This is an important change since many new bridge designs include "integral" abutments, where all of the bridge thermal movement takes place at the E-8H joint. Moving the lugs to the first concrete pavement panel allows the bridge thermal movement to take place and limits the amount of pavement "growth" due to incompressibles entering the pavement joints.

4) Include standard 5-297.231 which provides general drainage details. Identify the location and type of proposed drainage. The Road Designer has the prerogative to select an appropriate drainage system, but should provide either a catch basin or a flume at each corner of the bridge in order to reduce the possibility of erosion around the wingwalls, which has been a very significant and all too common problem when this detail is neglected.

Guidance is being developed regarding the use of approach panels adjacent to mechanically stabilized earth retaining walls and will be issued in the future.

Specific questions regarding the Approach Panel Standard Sheets can be directed to the Bridge Standards Engineer.

Design Standards CAD Directories

Because of a few inquiries on how to get information from our CAD directories, here is our present CAD directory on the system:

Standard Plates: http://standardplates.dot.state.mn.us/StdPlate.aspx

Standard Plans: http://www.dot.state.mn.us/design/standard-plans/index.html

Also on the internal web (for Mn/DOT only), Design Details: http://ihub/ots/design-services/standards/design.html (These are also in ProjectWise.)

Mn/DOT Internal Only - When accessing Standard Plan CADD files from ProjectWise, only those file versions marked APPROVED are suitable to be included as a Standard Plan. Those versions marked Historical or Working are not to be included as a Standard Plan.

If you are unfamiliar with our CAD directory, ask your local CAD operator for help. This is the best way to get any information you might need.

Standard Plans in CAD Directory

In the updating of approved standard plan sheets, changes may be of a minor nature, that the sheet does not need to be re-approved. In those cases a date will be put on the drawing in the area

to the left of the title box as shown. Final copies of standard CAD drawings should be put into the plans at the district final review, so as to get the most current copy. If modified this date should remain visible. Be careful that you are selecting the latest approved version and not a draft version as both are filed in the same location.

	STANDARD SHEET NO. 5-297.108M	
	STANDARD APPROVED JULY 30, 1991	
Revision Date 11-8-94	STATE PROJ. NO.	----

Be sure to fill in all pertinent cross reference notes on the standard plan sheets. Filling in the sheet numbers is not considered a modification.

Modifying Standard Drawings

Most of our standard drawings are used in plans as is, but on occasion there is a need to change or modify a standard drawing.

If a Standard Plan sheet contains details not associated with your project, it is optional for designers to cross out the undesired details. If any change is made to a Standard Plan sheet, including crossing out details as mentioned above, the following must be done to the plan sheet:

• Clearly cross-out the *Standard Sheet No*. and *Standard Approved* boxes in the sheet border.

• Add "Modified" text just above the Standard Sheet No. to indicate the standard plan has been modified.

• Add a signature block to the left of the title block for engineer's signature.

• Clearly cross-out and move any *Revision Date* notation, if present, to the left of or above the signature block.

• Identify the changes made to the details.

→ Label the changes using italicized text.

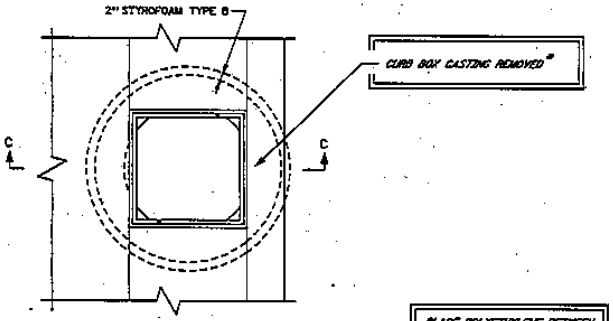
→ Footnote the changes with an asterisk. Place the following footnote above the signature block in italics: * *DENOTES MODIFICATION FROM STANDARD PLAN*

→ Use the MicroStation custom line style **StdsPlnMod** to place a double line (thick/thin) box around the text to highlight/identify the modification(s).

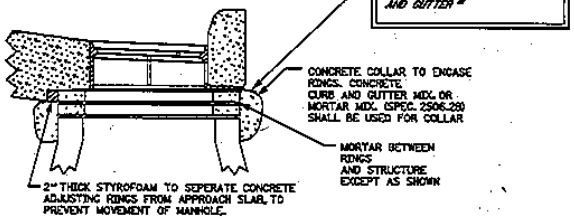
See example below…

SUMMARY OF QUANTITES FOR BRIDGE APPROACH PANEL

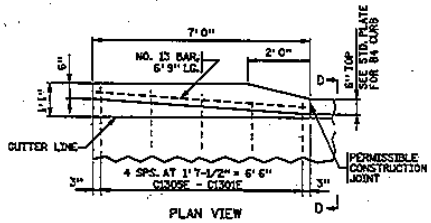
CONCRETE MIX NO. 3X42	CU. YD.
REINFORCEMENT BARS	LBS.
CURB DESIGN B4 INTEGRANT	LIN. FT.
CURB DESIGN B424	LIN. FT.



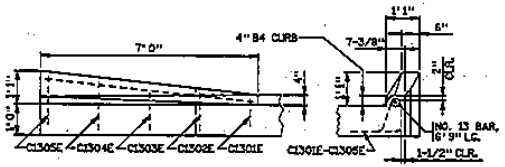
PLAN VIEW OF C. B. CASTING



SECTION C-C
(GRATE NOT SHOWN)

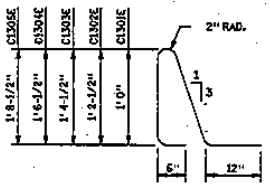


PLAN VIEW

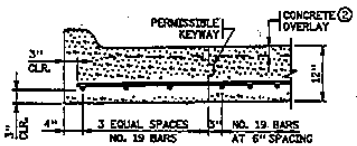


INSIDE ELEVATION SECTION D-D

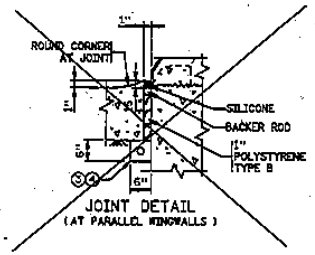
CURB TRANSITION DETAILS ③



C1301E- C1305E ③



CURB DETAIL ①
(B4 INTEGRANT CURB OR B424 MODIFIED CURB AND GUTTER)



JOINT DETAIL
(AT PARALLEL WINGWALLS)

NOTES:

ALL REBARS ARE IN METRIC DESIGNATIONS

① ALL REINFORCEMENT IN APPROACH PANEL AND CURB SHALL BE GRADE 60 AND EPOXY COATED AS PER SPEC. 3301.

② APPROACH SLAB THICKNESS SHOWN INCLUDES ANY CONCRETE OVERLAY THAT MAY BE REQUIRED. SEE BRIDGE PLANS FOR REQUIREMENTS. CONCRETE OVERLAYS TO BE INCLUDED IN BRIDGE QUANTITIES AND DONE AT THE SAME TIME BY BRIDGE CONTRACTOR.

③ 2" NOMINAL DIA. THERMOPLASTIC PIPE, AS PER ASTM D1785M, SCHEDULE 40. SLOPE PIPE TO DITCH. FURNISHING AND INSTALLING DRAIN SYSTEM SHALL BE INCIDENTAL, WITH NO DIRECT PAYMENT. WRAP PERFORATED PIPE WITH GEOTEXTILE AS PER SPEC. 3733. 1/8" PER 12" MINIMUM SLOPE.

④ BACKFILL WITH FINE AGGREGATE, SPEC. 3149, MODIFIED TO 0-3% PASSING A NO. 200 SIEVE.

MODIFIED

OPTION FINAL

" DENOTES MODIFICATION FROM STANDARD PLAN

REVISION DATE 2-1-2006

I HEREBY CERTIFY THAT THIS PLAN SHEET WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

ENGINEER _____ LIC. NO. _____

STANDARD SHEET NO. 6-297.224

STANDARD APPROVAL NOVEMBER 9, 1999

TITLE

BRIDGE APPROACH PANEL
BITUMINOUS MAINLINE ROADWAY
(MISCELLANEOUS DETAILS)

STATE PROJ. NO. ____ (TH ____) SHEET NO. __ OF ____ SHEETS

Old Details

Before using an old detail in the plan, check the Project wise design detail index to see if the detail sheet has been updated. Standards is constantly updating and adding standard sheets to their computer library. Be careful that you are selecting the latest version and not a draft version.

Reinforcement Bar Marks

All plans should display the new approved markings that are stamped on all new reinforcement bars. New bar designations are based on nominal bar diameter expressed in millimeters and should be used for all plans regardless of measurement units. The following bar designations should be used:

New Rebar Designation	Diameter (mm)	Diameter (in)	Old "English" Name
No. 10	9.5	0.375	No. 3
No. 13	12.7	0.500	No. 4
No. 16	15.9	0.625	No. 5
No. 19	19.1	0.750	No. 6
No. 22	22.2	0.875	No. 7
No. 25	25.4	1.000	No. 8
No. 29	28.7	1.128	No. 9
No. 32	32.3	1.270	No. 10
No. 36	35.8	1.410	No. 11
No. 43	43.0	1.693	No. 14
No. 57	57.3	2.257	No. 18

Concrete Median Islands

Concrete median islands placed on overlay projects that are 4 ft. (1.2 m) or less in width and have only a 1 ½ in. (40 mm) wearing course holding it in place should be pinned in place. A dowel 1 in. x __ in. (25 mm x __ m) long reinforcement bar spaced at about 4 ft. - 5 ft. (1.2 m - 1.5 m) shall be used to pin median in place. Length of dowel will vary according to thickness of concrete median. Bar should begin in 1 ½ in (25 mm) below the top of concrete median to an embedment of approximately 6 in. - 8 in. (150 mm - 200 mm).

Standard Plate No. 3006

On all construction plans whenever you have (2501) RC Pipe, (2501) Reinforced Concrete Dissipator Ring, (2502) Reinforced Concrete Pipe, (2503) Reinforced Concrete Pipe Sewer, or (2506) Reinforced Concrete Pipe. Add Standard Plate 3006 to the plan.

Curbs

Curbs on high-speed roadways should be discouraged. But if they are deemed necessary, use a B4 design. On ramps a D4 should be used. For loops, use a D4 on the outside and a B4 on the inside.

Unapproved Drawings

(These drawings are frequently used in plans; they have not been fully tested and approved. Some of the drawings show proprietary products.)

Unapproved Drawings are available in MicroStation format for internal Mn/DOT.
These details can be found on ProjectWise at …

OTS\DesignStandards\DesignDetails and/or
OTS\DesignStandards\DesignDetails\Development

The "Reference Date" shown on the Unapproved Drawing must be kept in the drawing (and not altered) when preparing the sheet for insertion into the plan.

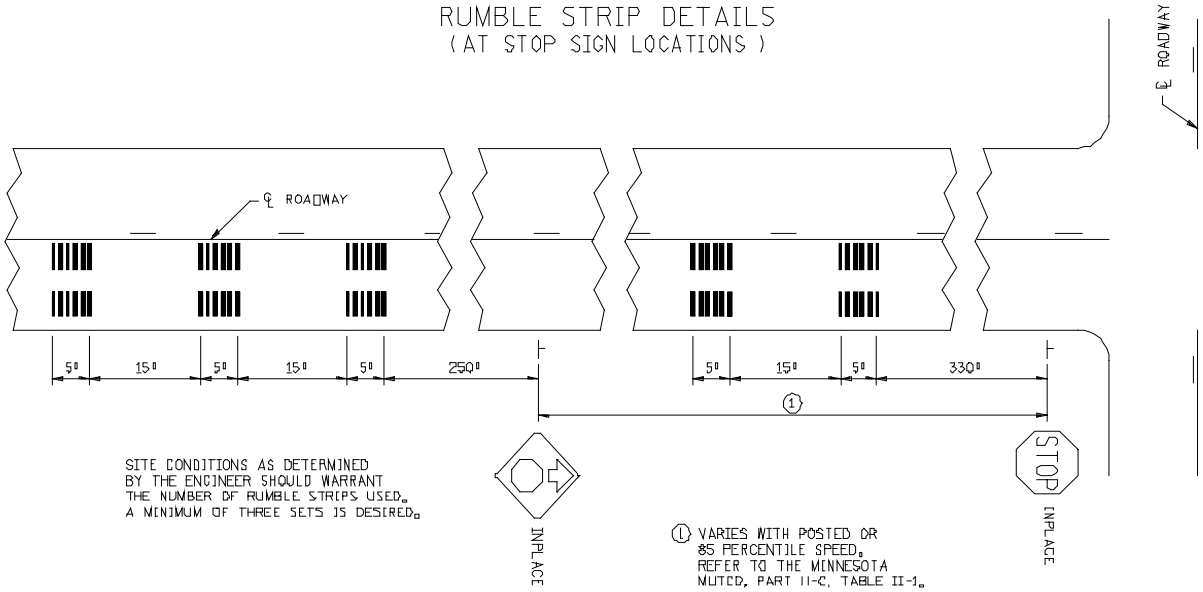
Rumble Strip Details (At Stop Sign Locations)

The detail shown on the next page shall be considered an unapproved standard detail to be used at stop sign locations (all units are in inches). However, the usage shall be a District/Division Traffic Engineers recommendation as to when and where to be used.

This detail can also be found on ProjectWise at

OTS\DesignStandards\DesignDetails\Development\rumstop_dd.dgn

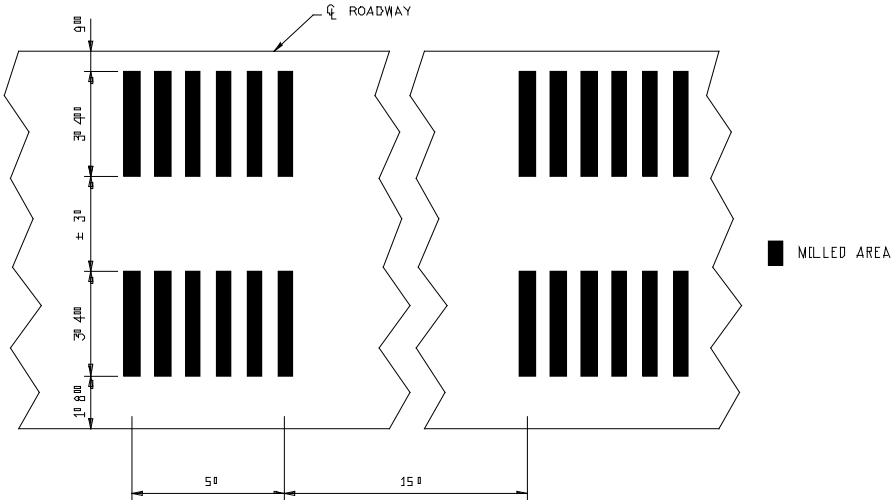
RUMBLE STRIP DETAILS
(AT STOP SIGN LOCATIONS)



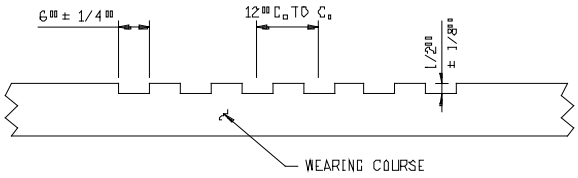
SITE CONDITIONS AS DETERMINED BY THE ENGINEER SHOULD WARRANT THE NUMBER OF RUMBLE STRIPS USED. A MINIMUM OF THREE SETS IS DESIRED.

(1) VARIES WITH POSTED OR 85 PERCENTILE SPEED. REFER TO THE MINNESOTA MUTCD, PART II-C, TABLE II-1.

PLAN VIEW



ENLARGED PLAN VIEW



SECTION

REFERENCE DATE
10-21-99

Concrete Joint Repair

The concrete joint repair details and construction notes are now available on the internet. They can be found at
http://www.dot.state.mn.us/materials/concretedocs/pvmt2005b.pdf

The joint repair and construction notes should be placed in the construction plans not in the Special Provisions. Contact the concrete office for the latest information.

Standard plate 4134

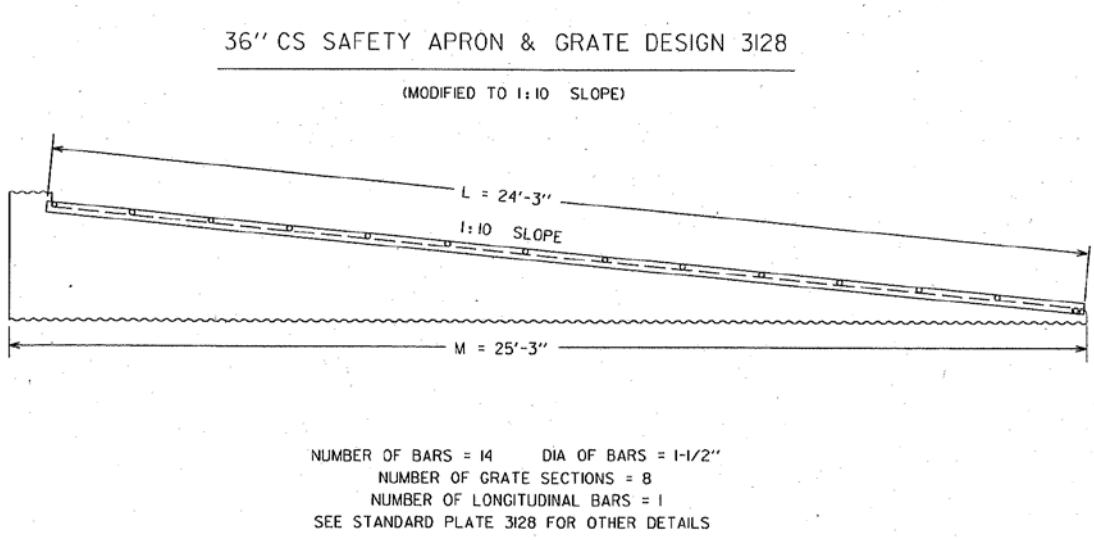
Standard plate 4134, Curb Box Casting for Catch Basin (for Design B Curbs), was created specifically for use with 4" B curb. Some problems have occurred with this curb box. Input from the districts and the Bridge Hydraulics Section indicate that breakage has been caused by installation problems. Curb boxes are considered effective only at low-points and should normally not be used at structure locations on-grade. Proper field installation of curb boxes is important, but designers should avoid their use except at low-points. This is especially important when designing for 4" curb and gutter.

Parrallel Pipes and Aprons in the Median

Parrallel pipes located in the median require safety aprons, must be grated, and the slope modified to a 1:10. The only apron design that must be used is Apron and Grate Design 3128. If concrete pipe is used standard plate 3128 covers the connection to the concrete pipe. The plan must also include a design detail for the 1:10 apron.

Examples of this detail can also be found on ProjectWise at …

OTS\DesignStandards\DesignDetails\SafeAprn1_10b_dd.dgn
OTS\DesignStandards\DesignDetails\SafeAprn1_10sm_dd.dgn
OTS\DesignStandards\DesignDetails\SafeAprn1_4_dd.dgn
OTS\DesignStandards\DesignDetails\SafeAprnAnchor_dd.dgn



CHAPTER 4: EARTHWORK

Construction Notes

Pertinent construction notes should be shown in the plan whenever possible, rather than included in the special provisions. This makes it clearer and easier for the contractors bidding the job, as well as for our engineers, inspectors, etc. It is better to have as much information as possible shown in one document rather than having to refer to two of them, and the pertinent information is less likely to be overlooked while bidding the project or constructing it in the field.

Excess Material

The special provision recommendations governing disposal of waste materials and/or surplus excavated materials off the right of way are quite inconsistent. Some districts submit recommendations that cover such disposal vary comprehensively, while others are extremely vague.

Since protection of the environment, such as wetlands, has become so vital, we feel that standard comprehensive provisions should be established and used on all projects, state-wide, where disposal of materials off the right of way is required.

It is recommended to use the note…ALL MATERIAL NOT UTILIZED ON THIS PROJECT SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND DISPOSED OF OFF THE R/W IN ACCORDANCE WITH SPEC 2104.

Bituminous Removal

When bituminous removal is included in common excavation (i.e. less than 6 in (150 mm) in thickness) the designer should put a note into the plan stating this fact. A minimum note could read: Bituminous Pavement removal is included in common excavation. A more explicate note may read: Common excavation includes approximately __ cu. yds (m^3) of bituminous pavement removal. The best way to handle this is to show bituminous removal on the earthwork tabulations.

The plan should also state the approximate depth of the bituminous removal.

Check Earthwork Quantities

Please ensure earthwork design calculations are checked carefully. We have paid large claims due to plan errors in the earthwork calculations.

CHAPTER 5: UTILITIES

General Information

Experience shows that proactive utility coordination early in the design of a project minimizes the amount of effort needed later in the design life and during construction. It also helps the state avoid costly unexpected problems and claims. Mn/DOT has developed a 15-step utility coordination process that emphasizes communication among all parties involved. This process is outlined in detail in the Mn/DOT *Utilities Manual*, which is available online at http://www.dot.state.mn.us/utility/files/pdf/policy/utilities-manual-web.pdf.

Many federal and state laws, rules, and regulations govern how the state handles utilities on its projects. They are listed below.

- Federal Laws
  - 23 USC 109(I)
  - 23 USC 123
- Federal Regulations
  - Part 645 of title 23 of Code of Federal Regulations
- Federal Guidelines
  - *Program Guide: Utility Adjustments and Accommodations on Federal Aid Highway Projects*, Sixth Edition, January 2003, FHWA-IF-03-014
  - *Highway/Utility Guide*, June 1993, FHWA-SA-93-049
- Minnesota State Constitution
  - Article 1, section 13
  - Article 14, section 2
- Minnesota Statutes
  - Section 161.20, subdivision 1
  - Section 161.45
  - Section 161.46
  - Section 222.37, subdivision 2
  - Section 216D.04
- Minnesota Rules
  - Parts 8810.3100 through 8810.3600

The "Laws, Rules, and Regulations" section on pages 7 though 9 of the *Utilities Manual* briefly describes each of these items, and Appendix A of the Manual provides links to the actual documents.

Mn/DOT's 15-Step Utility Coordination Process

A brief overview of the 15-step utility coordination process is described below.

Step 1: Utility Identification

Find utility owners the project may affect by contacting Gopher State One Call and using any other methods available (e.g., historical permits, old plans, etc.). Send the Utility Identification Letters to those utility owners.

Step 2: Utility Contact for Information

Develop preliminary plan sheets to send to the utility owners and prepare for the Utility Information Meeting.

Step 3: Utility Information Meeting

Send the Utility Information Meeting Letter to the utility owners. Prepare for, hold, and follow up on the Utility Information Meeting. Request information from the utility owners.

Step 4: Review of Information from Utility Owners

Receive and review information that the utility owners provide. Contact them about any errors or inaccuracies.

Step 5: Utility Design Meeting

Send the Utility Design Meeting Letter to the utility owners. Prepare for, hold, and follow up on the Utility Design Meeting.

Step 6: Request for Utility Relocation Plans

Request detailed relocation plans and schedules from the utility owners.

Step 7: Utility Coordination Follow Up

Review the relocation plans and schedules and follow up with the utility owners if there are any questions.

Step 8: Utility Design Change Meeting (optional)

The Utility Design Change Meeting is only necessary when there is a major change to the design of the project that will affect utilities. Prepare for, hold, and follow up on the Utility Design Change Meeting.

Step 9: Gopher State One Call Verification

Contact Gopher State One Call no more than 90 days before plan submittal to see if there have been any changes or additions to existing utilities.

Step 10: Utility Relocation Plan and Schedule Review

Review the relocation plan and schedule with Construction.

Step 11: Reimbursement and Utility Agreements (if necessary)

FYI…The Utility Agreements and Permits Unit performs this step when there are utility agreements on a project.

Step 12: Notice and Order and Utility Relocation Permit
FYI…The Utility Agreements and Permits Unit issues Notice and Orders and handles long-form permit applications.

Step 13: Utility Information in Contract Documents
Include all utility information in the request for bids.

Step 14: Construction
Construction coordinates any actual relocation in the field.

Step 15: Close Out (if necessary)
FYI…The Utility Agreements and Permits Unit closes out any utility agreements.

Abbreviated Utility Coordination Process

The state requires the districts to use the full, 15-step utility coordination process on all projects, with a few exceptions. Projects that may qualify for the abbreviated process include those that:

- Have a timeframe less than 12 months;
- Are stand-alone bridge replacement, removal, renovation, and repair projects;
- Have no new right of way;
- Are mill and overlay projects;
- Require excavation but the exact location of excavation is determined in the field; and
- Require excavation for work with little latitude for adjustment in the field.

Refer to the "Project Categories for Abbreviated Process Application" on pages 11 through 14 of the *Utilities Manual* for more information about these projects and which steps you can eliminate from the process.

Depicting Utility Facilities on Plans

State law dictates how we must address utilities on our construction plans. If any required utility information is missing, the state is responsible for the costs for any damages to facilities or disruptions of service.

Although it is best to have separate utility sheets, you can include utility information on other plan sheets if necessary. Appendix L of the *Utilities Manual* contains sample utility sheets.

General Requirements

- If there is a petroleum or high-pressure gas line in the vicinity of the project, include a warning note on the title sheet of the plan. (i.e. WARNING! PETROLEUM PIPELINE CROSSING)
- Ensure that the names of the utility owners on the plan sheets are the correct, legal names of those companies or agencies. Refer to UMART or the contact list on the Utilities website, http://www.dot.state.mn.us/utility/files/pdf/contacts/contact-utility.pdf, for the

most current names. Do NOT include contact names, phone numbers and/or e-mail addresses.

- Include the utility quality level note:
  The subsurface utility information in this plan is utility quality level ___. This utility quality level was determined according to the guidelines of CI/ASCE 38-02, entitled, "Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data." This not must be included in the plan whether utilities are affected or not.
- State whether electric facilities are transmission or distribution. Include the voltages of all power lines that are 69 kV or more.

Utility Tabulations

You must include ALL utility facilities that appear on the plan sheets in the tabulations, and you must include ALL utility facilities that appear in the tabulations on the plan sheets. Do not duplicate facilities in the plan sheets. Do not tab facilities that are too far away to appear on the plan sheets.

A sample of a utility tabulation is shown below.

Station	Location	In-Place Facility	Action			Utility Owner
			Leave As Is	Adjust	Relocate	
1+00 to 2+00	3 ft RT to 10 ft RT	buried telephone	X			Qwest Corp
2+00 to 3+00	10 ft RT to 9 ft RT	buried telephone	X			Qwest Corp
3+00	9 ft RT	telephone pedestal			X	Qwest Corp

If you have a long project but will only affect utilities in specific locations, only show and tab utilities in those specific locations. For example, if you have a ten-mile mill and overlay project with two culvert replacements, provide plan views of the culvert replacements that show the utility facilities and tabulate those facilities. If there are other utility owners that have facilities in the project limits but not in the vicinity of the specific work, include the following statement and list the names of the utility owners:

> The following utility owners have facilities within the limits of the project but will not be affected.

No Affected Utilities

If there are no utility facilities in the project limits, include the utility quality level note and the following sentence:

> There are no utility facilities within the project limits.

If utility facilities are present but the project will not affect them, tabulations are not necessary. In those cases, in addition to the information provided in the *General Requirements* section above, use one of the following notes or something similar in the plan:

- No utilities are affected by this project.
- This project does not include excavation, therefore no utilities will be affected.
- The utilities on this project are located outside the limits of excavation and will not be affected.

In addition to one of the statements above, include following language followed by a list of the utility owner names:

- The following utility owners have facilities inside the limits of the project.

Left In-Place Out-of-Service vs. Abandoned

On occasion, utility owners will stop using certain facilities without removing them from the right of way. If you have a project where this is going to happen, make sure you use the correct term to describe the situation. In general, you should use the phrase "Leave In-Place Out-of-Service" for the affected facilities. This language tells the utility owner that it will retain ownership and responsibility, and therefore liability for the facilities. The term "Abandon," however, turns responsibility and liability of the facilities over to the state.

Utility Locations and Elevations

Show the location of all utility facilities on the plan, profile, and cross section sheets of the plan. Appendix M of the *Utilities Manual* shows the standard symbols to use to represent each facility.

If you do not know the depth of underground facilities, use the following assumptions on the cross-section sheets:

- Telecommunications: 3.0 feet below the surface;
- Gas: 2.5 feet below the surface;
- Electric: 3.5 feet below the surface; and
- Water: 7.5 feet below the surface.

Utility Agreements and Permits Unit (Utilities Unit)

The Utilities Unit sends a copy of the plan to all of the utility owners listed. They must send a Notice and Order to ALL utility owners that need to adjust or relocate their facilities because of our construction, whether there will be an agreement or not. Utility agreements are only necessary when money is changing hands. The Utilities Engineer makes the final decision about whether utility work is reimbursable, so always check before making promises to utility owners. There are three situations in which the state MAY reimburse utility owners.

- The utility owner must relocate facilities from a location on which it has a property right, such as an easement.
- The relocation meets the requirements of a municipality's first move.
- The project is on interstate right of way.

Agency agreements are receivable agreements that are required when Mn/DOT's contractor will be placing, adjusting, or relocating utilities as part of the construction contract. A bridge attachment is the most common type of work covered by an agency agreement.

CHAPTER 6: STAGING

NO ARTICLES

CHAPTER 7: ALIGNMENT

NO ARTICLES

CHAPTER 8: REMOVALS

Building Removals

In the past years it has been a requirement to have a separate building removal pay item (i.e. Building Removal A, Building Removal B, etc..) For each parcel. It has been determined (from the C.O. Land Management Office) that all parcels may be covered by one building removal pay item, this would be Central Offices preference. Every building removal plan must include…

→ 2103.501 Building Removal by Lump Sum

However, the following items need to be covered by separate pay items per parcel on every building removal plan.

→ 2103.505 Disconnect Sewer Service by Each
→ 2103.507 Disconnect Water Service by Each
→ 2103.511 Basement Fill by Cu Yd (add note…THE CONTRACTOR SHALL PROVIDE AND RAKE IN GRASS SEED MIXTURE ??? AT A RATE OF ??? POUNDS PER ACRE ON ALL DISTURBED AREAS (INCIDENTAL))
→ 2105.509 Remove Underground Tank by Each
→ 2105.509 Remove Aboveground Tank by Each
→ 2104.601 Regulated Waste Evaluation by Lump Sum or 2104.601 Remove Regulated Waste Material by Lump Sum (used for Asbestos, fluorescent bulbs, mercury switches, etc.)
→ 2104.509 Remove Septic Tank by Each (note if it includes the drain field or not)
→ 2104.525 Abandon & Seal Well Shaft by Each
→ 2573.502 Silt Fence, Type Machine Sliced by Lin Ft

Remove Bituminous Shoulder

It has been brought to attention that when bituminous shoulders are removed the remaining aggregate shouldering material is not of sufficient quantity We are advising that either an item (if none exists) or additional quantity of shouldering aggregate be added to the plan to cover this shortage.

Remove Concrete Pavement

Mn/DOT settled a claim for the extra cost of removing reinforced concrete pavement. The contractor claimed that since the plan did not state that the pavement to be removed was reinforced or contained steel, his bid was based on removing non-reinforced pavement. Moreover, he proved that on several other Mn/DOT projects that required removal of reinforced pavement, the plan indicated the inplace pavement to be reinforced.

In order to prevent future claims and be consistent, designers should footnote the concrete pavement removal item indicating the type of reinforcing: mesh, rebars and/or dowel bars.

Remove Bituminous Pavement

Whenever the pay item Remove Bituminous Pavement is used it should state somewhere in the plan (either as a note or in the typicals) what the depth of the pavement removal is. This is to ensure that all Contractors are bidding the project based on the same information

Remove Pavement

There has been considerable misunderstanding on when this pay item should be used. This item is only used for cases where there is existing bituminous over existing concrete that is to be removed. When this item is used it should state somewhere in the plan (either as a note or in the typicals) what the depth of the bituminous pavement removal is as well as the depth of the concrete pavement removal and if the concrete is reinforced or non-reinforced. This is to ensure that all Contractors are bidding the project based on the same information

CHAPTER 9: PLAN AND PROFILE

Plan Sheets

Assure that all labeling is correct and present on the construction plan sheets. It should include, but not be limited to…Begin/End SP's, mainline, cross-streets, stationing, scales (bar scales only), north arrows, and equations (if not included on the general layout).

Median Crossover/Signalized

The following information is a first attempt at a solution. Neither the AASHTO Green book nor our design manual give any guidance on this issue. The design of median crossovers at crossroads on divided roadways has been a significant problem. Vehicles often "bottom out" when traversing the crossovers at crossroad speeds.

Methods of flattening the median crossovers between the through lanes have had only limited success in solving the problem. Other ideas have been suggested, such as sloping the inside through lane up to match the slop on the outside through land and putting a high point in the middle of the crossover. This has potential drawbacks for drainage and through traffic. As a compromise for now, designers should use the following for median crossover design.

Transition the inside through lane to 0.005 ft./ft (0.005 m/m) sloped down toward the median. Continue that slope to the middle of the median crossover to intersect a similar slope from the other roadway. This will reduce the rollover at the roadway crown and at the middle of the median crossover. Roadways in superelevation should be designed so the profiles will allow slopes to be in the same direction all the way across both roadways and the median crossover. This will help eliminate the "roller coaster" effect.

Special Ditch Grades

There has been some discussion on where special ditch grades should be computed to and shown in the plans (bottom or top of topsoil). Engineers, inspectors and surveyors were consulted and the general conclusions was that the designers should compute to and show the ditch grades to the bottom of the slope dressing. A note should be placed in the plans explaining their location.

CHAPTER 10: PAVING

Compaction of Bituminous Mixtures
Bituminous density requirements **should not** be placed in the construction notes or any where else within the plan.

(2360) Plant Mixed Asphalt Pavement
The specification states that all pavements will be compacted in accordance with the Maximum Density Method unless otherwise specified in the Contract special provisions or as noted in Section 2360.6C. Section 2360.6C is titled "Ordinary Compaction Method".

Bituminous Items in Plans
Mix designations for bituminous items are required in the plan.

The following is the recommended way to show Bituminous Items on the estimate sheet, typical sections, tabulations, and everywhere else they appear.

ESTIMATE SHEET

9.5
12.5
19.0 1-7 , A-I,L 1.5-5

2360.501 Type SP ___ Wearing Course Mixture (__, __)
2360.502 Type SP ___ Non Wearing Course Mixture (__, __)
2360.503 Type SP ___ Wearing Course Mixture (__,__) __" Thick

The format for 2360 Pay Items will be as follows:
2360.501 Type SP __._ _____Course Mixture (_,_)……English ton (metric ton)

An example of the pay item for the following mixture designation (SPWEA440A) is:
2360.501 Type SP9.5 Wearing Course Mixture (4,A)……metric ton (English ton)
Note: Number in parenthesis denotes the traffic level and the letter denotes the PG grade.

TYPICAL SHEET
2" (40 mm) Type SP 9.5 Wearing Course Mixture (SPWEA440A)
2" (40 mm) Type SP 12.5 Wearing Course Mixture (SPWEB440A)
2" (40 mm) Type SP 12.5 Non Wearing Course Mixture (SPNWB440A)
2" (40 mm) Type SP 19.0 Non Wearing Course Mixture (SPNWC440B)
Type SP 12.5 Wearing Course Mixture (SPWEBA440A) 2" Thick

TABULATION SHEET

2360 Type SP 9.5 Wearing Course	2360 Type SP 9.5 Wearing Course 2” Thick
(SPWEA440A)	(SPWEA440A)

NOTE: All of the above are shown as examples only. The following are what the various letters and numbers represent.

For the 2360 Specs (SPWEA440A)

The first two letters (SPWEA440A) represent the mix type…
SP = Superpave

The third and fourth letters (SPWEA440A) represent the course…
WE = Wearing Course
NW = Non Wearing Course

The fifth letter (SPWEA440A) represents the aggregate size…

A = 1/2 inch [12.5mm], SP 9.5
B = 3/4 inch [19.0mm], SP 12.5
C = 1 inch [25.0mm], SP 19.0
D = 3/8 inch [9.5mm], SP 4.75

The sixth digit (SPWEA440A) represents the traffic level…

Traffic Levels
Traffic Level 20 Year Design ESAL's (1 x 106 ESAL's)
2 < 1
3 1 to < 3
4 3 to < 10
5 10 to < 30

The last two digits indicate the air void requirement: (SPWEA440A)

40 = 4.0% for SP and Wear mixtures
30 = 3.0% for SP Non Wear and Shoulder

The letter at the end of the mixture designation identifies the asphalt binder grade (SPWEA440A) :

A = PG 52 34
B = PG 58 28
C = PG 58 34
E = PG 64 28
F = PG 64 34
L = PG 64 22
H = PG 70 28

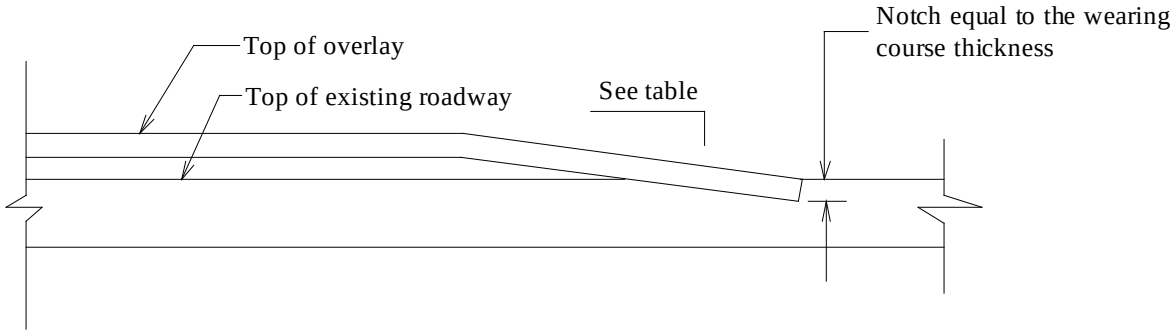
Overlay Transition Tapers

Currently, Mn/DOT does not have a policy or standard regarding the rate of transition tapers at the beginning and end of pavement overlays. As a result of this there is quire a variation in taper rate used throughout the state, ranging from about 1:240 to 1:600. Experience in Minnesota indicates that a transition taper of 1:400 results in an acceptable ride for high-speed roads. A recent survey of other state DOT's indicated that 1:400 is typical of taper rates used country-wide.

In order to provide pavement overlay transitions that provide a smooth ride, yet are economical, the rate of transition taper on pavement overlays should be determined from the following table.

DESIGN SPEED	RATE OF TAPER
50 mph or greater 80 km/h or greater	1:400
35 to 45 mph 60 to 70 km/h	1:300
30 mph or less 50 km/h or less	1:200

Prior to placement of an overlay, the in-place surface in each taper should be notched as shown in the sketch below.



Concrete Pay Items

Use these pay items whenever there is any concrete pavement pay items **except bridge approach panels and concrete pavement rehabilitation** ***on the job.***

Use 2301.604 "Concrete Pavement" by the SQ YD (m2) Pay Item when 2360 pay items are Square Yard Inch. Use 2301.604 "Place Concrete Pavement" by the SQ YD (m2) and 2301. 51X "Structural Concrete" by CU YD (m3) Pay items when 2360 pay items are Tons.

The Designer shall select ONE of the following MEASUREMENT options A or B
A – Use this for concrete pavement designed with a **UNIFORM CROSS-SECTION THICKNESS** such as new construction/grading.
B - Use this for concrete pavement designed with a **VARIABLE CROSS-SECTION THICKNESS** such as unbonded concrete overlays and whitetopping.
Contact the Concrete Engineering Unit if questions arise as to which option to select.

The Department will pay for concrete pavement on the basis of the following schedule:

Item No.:	Item:	Unit:
2301.604	Concrete Pavement ___ in [___ mm]	SQ YD (m2)
2301.604	Concrete Pavement ___ in [___ mm] High-Early	SQ YD (m2)
2301.604	Place Concrete Pavement ___ in [___ mm]	SQ YD (m2)
2301.511	Structural Concrete	CU YD (m3)
2301.513	Structural Concrete High-Early	CU YD (m3)
2301.608	Supplemental Pavement Reinforcement	Pound (kg)
2301.603	Dowelled Expansion Joints, Design ___	Lin Ft (m)
2301.538	Dowel Bar	EACH
2301.541	Integrant Curb, Design ___	Lin Ft (m)

The following are the **same** for **all** options:

1. Pavement Reinforcement has been renamed Supplemental Pavement Reinforcement and is shown as the following under Method of Measurement and Basis of Payment:

C Supplemental Pavement Reinforcement

Supplemental pavement reinforcement will be measured by mass (weight). Included in the measurement will be all supplemental pavement reinforcement over culverts, storm sewers and water mains.

Payment for supplemental pavement reinforcement of each type specified at the Contract prices per unit of measure of pavement in which the reinforcement is placed will be compensation in full for all costs of furnishing and placing the metal reinforcement as specified, including all costs of tie wires, supporting devices, splicing, intermediate strike-off, and any other operations or materials needed to furnishing and placing the reinforcement.

2. Reinforcement Bars are now incidental and is shown as the following under Method of Measurement and Basis of Payment:

E Reinforcement Bars

Reinforcement bars will be considered incidental. Included in the measurement will be all keyway bars, tie bars, taper steel, stopper bars and any other reinforcement bars necessary to construct the concrete pavement as designed. No measurement will be made under this item of those bars that are paid for as supplemental pavement reinforcement.

3. Bridge Approach Panels will be paid for by the square yard only. A separate special provision is available until the next Spec book is issued and is shown as the following under Method of Measurement and Basis of Payment:

H Bridge Approach Panels

When the Proposal contains an item (or items) for construction of bridge approach panels, their construction will be measured and paid for separately as complete in place items. Measurements will be by the total area of all panels of the same basic design. In the absence of such items, the panel construction will be measured for payment under the several items provided for pavement construction.

4. Concrete Coring will be incidental and is shown as the following under Method of Measurement and Basis of Payment:

J Concrete Coring

The Engineer will measure the number of cores designated in the Contract or ordered by the Engineer that are acceptable taken, identified and delivered as required.

Payment for required coring shall be incidental. No direct compensation shall be provide for the costs of material, labor, and equipment necessary to take the cores, deliver the cores as directed, fill core holes, provide traffic control, or any other costs associated with the concrete coring.

Dowel Bar Diameter

District 2 Design has discovered a discrepancy between the Pavement Manual and the pavement joints standard plan sheet regarding dowel bar diameters.

Pavement Manual Section 5-3.0 (42) shows the following dowel bar sizes…

Table 5-3.8 Concrete Pavement Dowel Bar Sizes

Pavement Thickness	Dowel Bar Diameter
Inches (in)	Inches (in)
$t < 10.5$	1.25
$10.5 \leq t \leq 13$	1.50
$13 \leq t \leq 14$	1.75

Standard Plan sheet 5-297.221 (1 of 2) shows the following dowel bar sizes…

DOWEL BAR DIAMETER TABLE

PAVEMENT THICKNESS	DOWEL BAR DIAMETER
LESS THAN 6”	NONE
6” – 6 ½”	1”
7” – 10”	1 ¼”
10 ½” – 14”	1 ½”

The Standard Plan sheet 5-297.221 (1 of 2) is the most current version and is the one to use when determining dowel bar diameters.

Joint Sealing Requirements

The Concrete Engineering Unit has revised its policy for sealing concrete joints. Joint Sealing Recommendation Guidelines are available on the Concrete Engineering website for reference (similar to the PG Binder Guidelines).

The contraction joint sealing standard is now considered to be 1/8” single saw cut – hot pour sealed joint. In some cases, it is recommended to use unsealed 1/8” single saw cut joints in unbonded overlays and well-drained bases and neoprene joints will still be the standard joint sealant in the Metro Area. Silicone will still be an available option on the Standard Plan Details but will no longer be the standard sealant type for concrete pavements.

Contact the Concrete Engineering Unit for recommendations of if and how to seal the joints.

The Special Provisions have also been modified to no longer require sawing and sealing the longitudinal construction joints between a concrete median or gutter section and a concrete pavement between two concrete pavement sections.

Concrete Joint Pay Items

Due to changes in the incidental items (see chapter 2) the following section will be revised as follows…

There seems to be a number of people with questions on what joints to pay for on new concrete pavement. The following is a brief explanation. The specification book gives the guidelines. We encourage a tabulation on the plan which defines square yard quantities and cubic yard quantities (as required).

We do not pay for the Longitudinal Joints, Contraction Joints, E1-1 joints or the E1-H joints and these items should not be included in the tabulation.”

Payment for joints should be limited to the expansion joints, such as:
E2H-D, E4H-D, E8. According to the specs, this includes dowel bar assemblies.

The number of construction header joints is usually controlled by the contractor and, as such, we should say that they are incidental. Also, when these headers are incidental, it is recommended that a note be included stating the steel needed (i.e. #25 bars for construction headers). Concrete pavement lugs and permanent headers should be paid for by the lin. foot.

Concrete Overlays

Concrete Overlays over existing concrete or existing bituminous is called "Whitetopping" or "Unbonded" Concrete.

Contact the Concrete Engineering Unit when designing any of these type of projects for assistance in determining the special provisions and the language needed for surveying, paying for the bond breaker, the concrete, etc..

Concrete Pavement Rehabilitation (CPR)

The Concrete Rehabilitation Standards are available for downloading as boilerplates on the Concrete Office website at http://www.dot.state.mn.us/materials/concretepavement.html.

In an effort to simplify and clarify the process, the details have been reduced and combined in many cases including combining the details with the *State Aid Concrete Pavement Rehabilitation Best Practices Manual* published in 2006. All the CPR Details that Have the LV (Low Volume) designation are intended for State Aid Projects only. For Interstate highways or Trunk highways, use only the details the do not contain the LV designation.

Because all Type B & C details include Joint Repair (Type A1) as an incidental part of preforming a Type B or C repair. All projects will need to include Joint Repair (Type A1) detail for informational purposes.

Several tables are provided below showing the previous MnDOT Repair Details and the current detail including changes to the repairs.

<table>
<tr><th colspan="3">TYPE A REPAIRS</th></tr>
<tr><th>Previous</th><th>Current</th><th>Changes to A Repairs</th></tr>
<tr><td>Type A-1H or S
Type A-3H or S
Type A-5H or S</td><td>Saw and seal - Joint Repair (Type A1)</td><td rowspan="2">• No longer have to choose a width of the repair.
• Single repair is now for both the longitudinal and transverse joints or cracks.
• Hot pour sealer 3725 is no longer a pay item, now included as part of the A1 or A2 pay items. One less pay item to track.
• Took sealing chart out of special provisions and placed on the Type A repair details.</td></tr>
<tr><td>Type A-4H or S</td><td>Clean and seal - Joint Repair (Type A2)</td></tr>
</table>

TYPE B REPAIRS		
Previous	**Current**	**Changes to B Repairs**
Type B-2A	Partial Depth Repair (Type BA)	• Sawing and sealing the joints or cracks within the Type B repairs is now incidental to the individual B repair item. • Clarified the Type BE repair will only be measured and paid if Steel is drill and grout into the repair.
Type B-2E	Partial Depth Repair Special (Type BE)	
Type B-3	Joint And Crack Repair (Type B3)	
TYPE C REPAIRS		
Previous	**Current**	**Changes to C Repairs**
Type C3-D	Full Depth Repair (Type CD-HV)	• Type CD-HV Has 4 dowels in each wheel path, 16 dowels vs 22 before. • Sawing and sealing the joints or cracks within the Type C repairs is now incidental to the individual C repair pay item. • The longitudinal length of the Type CD-HV repair is now 4', was 3.5' • Up to Engineer if they want to skew the CD-HV repair vs squaring up with the roadway. • Can use the CD-HV in the longitudinal direction. Replace the dowels with rebar's.
Type CX Type D-1 Type D-2	Pavement Replacement (Type CX)	

TYPE C-LV REPAIRS
Details intended for Low Volume Roadways ~ Non-State Highway Repairs

Previous	Current	Changes to Repairs
Type C3-D	Full Depth Repair (Type CD-LV)	• The longitudinal length is now 4' was 3.5' • Up to the Engineer if they want to Skew repair along existing contraction joint. • Can use the repair in the longitudinal direction. Replace the dowels with rebar's. Still have 6 dowels, but dowels are now placed in the wheel paths.
Type C-1	Spot Full Depth Repair (Type C1-LV)	
Type C-2	Utility Trench Full Depth Repair (Type C2-LV)	
Type C-3A	Full Depth Repair (Type CA-LV)	

MISCELLANEOUS REPAIRS

Previous	Current	Changes to Repairs
Dowel Bar Retrofit	Dowel Bar Retrofit	No significant changes made

"HOW TO" REPAIRS

Previous	Current	Changes to Repairs
None	Catch Basin Repairs	Uses MnDOT Standard Pay Items
None	Curb and Gutter	
None	Sidewalk Repair	

The pay items for these have changed as well. The new pay items are….

Item No	Description	Unit
2301.538	Dowel Bar	Each
2301.602	Drill and Grout Reinforcement Bar (Epoxy Coated)	Each
2302.602	Dowel Bar Retrofit	Each
2302.603	Joint Repair (Type A1)	Lin Ft (m)
2302.603	Joint Repair (Type A2)	Lin Ft (m)
2302.603	Joint and Crack Repair (Type B3)	Lin Ft (m)
2302.603	Full Depth Repair (Type CA-LV)	Lin Ft (m)
2302.603	Full Depth Repair (Type CD-LV)	Lin Ft (m)
2302.603	Full Depth Repair (Type CD-HV)	Lin Ft (m)
2302.604	Pavement Replacement (Type CX)	SQ YD (m2)
2302.604	Utility Trench Full Depth Repair (Type C2-LV)	SQ YD (m2)
2302.604	Concrete Grinding	SQ YD (m2)
2302.604	Partial Depth Repair (Type BA)	(m2)
2302.618	Partial Depth Repair (Type BA)	SQ FT

2302.604	Partial Depth Repair (Type BE)	(m2)
2302.618	Partial Depth Repair (Type BE)	SQ FT
2302.604	Spot Full Depth Repair (Type C1-LV)	(m2)
2302.618	Spot Full Depth Repair (Type C1-LV)	SQ FT
2302.608	Supplemental Reinforcement Bars (Epoxy Coated)	Pound (kg)

The special provisions have also been revised to reflect the changes to the CPR details. Some of the highlights and recommendations of the new 2302 Special Provisions are as follows:

Use of the Type A1 Repair

Most projects will not have the Joint Repair (Type A1) as a pay item. This is because all of the type B &C repairs now have the saw and sealing as a (incidental) part of performing the individual Type B or C repair. Even though the Joint Repair (Type A1) will not be used as a pay item on a project the detail will need to be included in the plan. This is because all of the Type B and C repairs details refer to the Joint Repair (Type A1) for the proper procedure for sawing and sealing joints and cracks that are contained within the Type B and C repairs.

If the entire project is to be sawed and sealed using the Joint Repair (Type A1), the type B and C repairs should be changed to have the Joint Repair (Type A1) as a pay item. The reasoning for not keeping the Type A1 Incidental to the Type B or C repairs is mainly for ease of measuring. In other word the person measuring joints will not need to stop and start the measurement at each repair. When clean and seal Joint Repair (Type A2) is used on the entire project, keep the Joint Repair (Type A1) incidental to the Type B and C repairs. Contact the Concrete Engineering Unit for further recommendations.

Note: The Concrete Engineering Unit does not recommend re-sawing and sealing in place joints on roadways with a speed limit of greater than 45 mph. Contact the Concrete Engineering Unit for further recommendations.

Pavement Replacement (Type CX) Repair

Another change is to the Pavement Replacement (Type CX) repair detail as to when drill and grout reinforcement bars (tie bars) are required. The repair detail states drill and grout reinforcement bars are not required unless the longitudinal repair length exceeds 75 feet. Unless a project is anticipating Pavement Replacement (Type CX) repairs greater than 75 feet long, do not include Item 2301.602 Drill and Grout Reinforcement Bar (Epoxy Coated).

Estimating Dowel Bar Quantities

In the past there has been some confusion as to what and how to estimate the quantity of Item 2301.538 Dowel Bar. Any drill and grouted dowels do not need to be included in Item 2301.538 Dowel Bar. Drill and grouted dowel bars are incidental to the Full Depth (Type CD-XX) repair.

Even though dowels are paid by the each, the dowels will be placed in a dowel basket. A typical basket contains 11 dowels. An 11 bar basket is typically used on a 12 foot wide section of concrete pavement. A 16 foot wide section of concrete pavement would have 15 dowel bars per

contraction joint. So whatever the width of the concrete pavement, subtract one from the width of the roadway and that is number of dowels per contraction (transverse) joint.

Use one of the following methods for estimating the number of contraction (transverse) joints

1. For every 15 lineal lane feet of pavement that is replaced one basket will be place. Or
2. For every 20 SQ YD (27 SQ YD for 16 foot wide pavement) of Pavement Replacement (Type CX) add one Contraction (transverse) joint.
   Note: The 20 SQ YD is for 12 foot wide lane, 12' wide by15' long /9 = 20 SQ YD
   A 16 foot wide ramp would be 16 feet by 15 feet /9 = 27 SQ YD

Multiply the number of computed contraction joints by width of the pavement minus one.

Early Opening Times on CPR Projects
Table 2301-1 has mix design parameters based upon the anticipated minimum time to opening.

Because of the ambient temperature requirements, consideration should be given to the time of year the CPR project is to take place. If Table 2302-1 is to be used, do not schedule a CPR project with an early start or will extend late into the construction season.

These provisions do not cover anticipated minimum times to opening of less than 24 hours, also known as ultra-high early concrete (UHE.) Ultra-high early concrete (UHE) is defined as any concrete that will have construction or general traffic place on the repairs with under 24 hours of cure time. Ultra-high early concrete projects require additional concrete testing, a test pour and other requirements that are not in the newly published 2302 special provisions. **When designing a project and the Engineer determines that the pavement repairs will need to be opened to traffic in less than 24 hours – *DO NOT use the standard CPR special provisions alone*. Contact the Concrete Engineering unit for the correct special provisions and further recommendations on projects with anticipated opening times with less than 24 hours cure time.**

Table 2302-1
Concrete Mixes for Opening Times

Anticipated Minimum Time to Opening *	**Concrete Mix Grade**	**Admixture Dosage & Type †** Based on Manufacturer's recommended dosage rate	**Mix Design Responsibility**	**Testing and Strength Required for Opening**
≥ 7 calendar days	3U18 ‡ 3A32	As needed	2302 2461	None
72 hours to < 7	3U18 ‡	Type A†	2302	None

calendar days *	3A32HE ‖		2461	
36 hours to < 72 hours *	3U18 ‡ 3A32HE ‖	100% of Maximum Type A †	2302 2461	None
24 hours to < 36 hours *	3U18 § 3A32HE ‖	40% of Maximum Type E †	2302 2461	None
< 24 hours	Contact the Concrete Engineering Unit	As needed	Contractor design	Control Specimens Per 2302.3.B.4

* Providing that ambient temperature are 60°F [15°C] or above. If the ambient temperature is less than 60°F [15°C], use control specimens to determine opening times in accordance with 2302.3.B.4.

‖ Fly ash is not allowed in high early concrete mixes.

† Recommended dosage is from the manufacturer of the admixture.

‡ The maximum slump for 3U18 mixes measured after 5 minutes is 1 inch [25 mm].

§ Type E accelerators are not allowed when the ambient air temperature exceeds 80°F [27°C] without the approval of the Engineer.

No control cylinders are required when all of the provisions of Table 2302-1 have been met. If the contractor uses a 3A32HE concrete with an approved type A or E admixture at the stated dosage from table 2302-1 **and** the ambient temperatures are at or above 60°F for the entire cure time, the roadway can be opened at the corresponding time to opening from Table 2302-1.

For further clarifications or for CPR recommendations contact the Concrete Rehab Specialist

CHAPTER 11: WALLS

Retaining Walls

The following is in the process of being prepared for possible inclusion into the RDM. The information was deemed important so that it is incorporated in the Design Scene for designers information.

Standard plans for cast-in-place retaining walls are included in the Standards Plans Manual or at the following website… http://standardplans.dot.state.mn.us/StdPlan.aspx on sheets 5-297.620 through 5-297.632. The plans include standard designs for wall heights up to 30 feet with three loading conditions and two types of foundations: spread or pile. The loading conditions are:

1. Level Backfill
2. Level backfill with 2 ft. live load surcharge (roadway adjacent to top of wall)
3. 1:2 sloped backfill

These standard designs are in accordance with AASHTO Standard Specifications using the design parameters shown on Standard Plan sheet 5-297.620. A Foundations Report is prepared for each specified wall project and contains a footing recommendation.

Alternate wall designs are non-standard designs consisting of either proprietary or special wall designs.

Proprietary designed walls are provided by vendors from pre-qualified product list that meet project specifications. All mechanically stabilized earth (MSE) walls fall into this category including prefabricated large wet-cast concrete modular block walls.

Mechanically stabilized earth walls and prefabricated large wet-cast concrete modular block should only be used on projects where the roadway designer has verified that the ground water table is below the elevation of the proposed leveling pad AND that all drainage systems installed behind the wall can be day lighted to a ditch or subsurface drainage system. If these conditions cannot be met or verified by the roadway designer this type of wall system should not be specified (An exception to this requirement may be granted for gabion basket walls by the Foundations Unit). Design or installation of mechanically stabilized earth walls in “bath tub” conditions or in undrained soils is prohibited.

Special designed walls do not fall into the standard or proprietary wall categories. These include cast-in-place cantilever walls taller than those shown on the standard sheets, steel sheet pile, soil nail, soldier pile and anchored walls.

Design Responsibility

The roadway designer has the responsibility to lead the plan development effort by coordinating the wall type selection process. The designer shall collect from the offices listed below the aesthetic requirements and the technical recommendations regarding the structural and

foundation aspects of the wall. All various wall types described later in this section should be considered in the selection process so that the most cost-effective and appropriate wall is constructed.

The road designer also has the responsibility to develop the plan, profile, cross sections and staging of the retaining wall and to prepare the construction plans.

The Structural Wall Committee (SWC) is responsible for establishing guidelines for submittals and for submittal review of new wall types used in MnDOT projects. The approved wall systems are listed on Mn/DOT Approved Products website.
Standard designs which cover a wide range of situations are available for use from the Standard Plans Manual. These standard designs were developed by the Bridge Office and may be used without a structural review. Alternate and non-standard designs, which include proprietary walls and walls not covered by available standards, require a special design by the Bridge Office or a consultant. It is the responsibility of the road designer to contact the Bridge Office to determine whether the non-standard wall design is completed by the Bridge Office or by others and to determine the timing and work effort involved.

The Foundations Unit is responsible for all geotechnical aspects of retaining walls and for preparing a foundation report for all wall types suggested by the road designer. The Foundations Unit should coordinate the subsurface investigation, perform laboratory analysis/testing, conduct a global and compound stability analysis (if required) and provide recommendations for the in-situ soil design parameters and foundation type. This responsibility is deferred to the District Soils Engineer for walls less than 5 feet high.

The Office of Technical Support, Landscape Architecture Unit and the Bridge Office Architecture Specialist, should be contacted regarding aesthetic and/or rustication treatments for retaining walls.

Preparation of Bid Documents and Plans
Wall plans fall into three categories; standard design, special design, and proprietary design. Currently, cast-in-place cantilever walls and dry cast concrete modular block walls have standard plan sheets. Preparation of plans and bid documents for all walls excluding proprietary walls should include complete details necessary for the construction of the walls using the standard plan sheets and specifications in combination with project specific information shown on additional sheets.

Special design walls include cast-in–place cantilever walls taller than those shown on the standard sheets, steel sheet pile, soil nail, soldier pile and anchored walls. Preparation of plans for these walls should include complete details necessary for the construction of the wall using project specific details and any standards or special requirements that may apply.

Plans for proprietary design walls should include pertinent information necessary for location and alignment including cross sections, plans, and profiles. Locations of drainage systems, utilities or other features impacting the design or construction should also be shown. The

balance of the details necessary for construction shall be provided by the wall vendor via the contractor as described in the Special Provisions.

Proprietary Designed walls

Per MnDOT specifications, all proprietary designed walls will be selected from the MnDOT Pre-qualified supplier lists, so it is not necessary to get a public interest finding for walls meeting the specifications.

All proprietary wall designs shall contain the following geometric and project specific information:

1. List of acceptable wall types and/or systems for each wall on the project.

2. Drainage

   Proprietary designed walls shall include a drainage system consisting of perforated pipe per MnDOT 3245 wrapped with a type I geotextile per MnDOT 3733. The pipe shall be placed such that water drains freely from the pipe, typically a 1% grade and 3 foot minimum radius bends. Provide outlets as required due to expected flow rate with a maximum spacing of 150 feet. Outlet the drainage system through the slope in front of the wall with a concrete headwall per MnDOT Standard Plate 3131 or into a drainage structure. The designer shall take into account the location of wall drainage systems in the layout and step locations of wall leveling pads and to ensure the wall drainage system is compatible with the leveling pad step locations. The designer shall denote the location of the drainage system components, including the station of each outlet penetration through the wall and whether the flow is outletted through the slope in front of the wall or into a drainage structure.

3. Geometrics
   a. Beginning and end of wall stations.
   b. Top of wall profile.
   c. Original and proposed ground line profiles in front of and behind the retaining wall. Profiles shall show all existing and proposed infrastructure (i.e., utilities and other existing or proposed structures) in the profile section.
   d. Cross sections at relevant wall locations, usually at no more than 50 feet intervals. Cross sections shall show temporary and permanent Right-Of-Way (ROW) easement limits and existing utilities.
   e. Plan view(s) of wall alignment showing ROW limits, existing and proposed utilities, etc.
   f. Wall alignment geometric data shall be shown and tabulated (similar to roadway alignment data).
   g. Details of foundation, leveling pad, aesthetics, or other detailed wall requirements.
   h. Details of wall appurtenances such as traffic barriers, moment slabs, coping, fencing, drainage, or other obstructions including but not limited to the location and configurations of signs and lighting including conduit locations and right-of-way limits.
   i. Construction staging requirements, if applicable, including sequence of traffic control, access, temporary construction, temporary fencing, temporary or permanent barrier, and temporary and permanent drainage.
   j. Elevation of highest permissible level for foundation construction.

k. Location, depth and extent of any unsuitable material to be removed and replaced. Details of any required ground improvement.
l. Quantities table showing estimated wall area and quantity of appurtenances and traffic barriers, together with notes identifying the assumptions made in estimating.
m. At abutments, elevations of bearing pads, location of bridge seat, skew angle and all horizontal and vertical survey control data including clearance and details of abutments.
n. At stream locations, extreme high water, normal water levels and estimated scour depth.
o. Grading material requirements adjacent to the wall, including details of any needed perforated pipe drainage or any other drainage requirements.

4. Geotechnical information
A copy of the subsurface investigation report and specific design values for the following parameters (where required)
a. Plan view of sampling, testing and boring locations across project site.
b. Subsurface profile across project site.
c. Boring logs.
d. All laboratory test data and results.
e. Engineering properties of the foundation soil, reinforced soil, and retained soil as appropriate to ensure the proper long-term performance of the MSE wall structure.
f. Required soil modification.
g. Global and compound stability analysis.
h. Allowable and ultimate bearing pressure beneath the wall footing and the reinforced earth mass.
i. Settlement analysis for the foundation soil beneath the wall and the reinforced earth mass.
j. Groundwater elevations, any free water conditions, anticipated high water conditions and any required drainage schemes.
k. Recommendations concerning items that may be appropriate to ensure the proper long-term performance of the wall structure.
l. Shear strength (drained and undrained for fine grained soils) of foundation soils.
m. Required shear strength and unit weight ranges of select backfill.
n. Shear strength of random fill or in-situ soil behind wall

5. General Structural and Geotechnical Design Requirements
The following are general design requirements for retaining walls that will be shown on the drawings or addressed in the contract documents. Specific design requirements for each of the wall types are discussed in the following sections
o. Design Life of the structure (example: permanent mechanically stabilized earth walls are designed, for minimum corrosion service life of 100 years)
p. Driving force and resistance for overturning, sliding and stability of temporary construction slopes. Analysis for global and compound stability is performed by Foundation Unit.
q. Ultimate and nominal foundation bearing pressure, minimum wall footing embedment depth and maximum tolerable total and differential settlements.
r. Internal design requirements for mechanically stabilized earth wall products.

s. Magnitude, location and direction of external loads due to bridge, overhead signs and lights, traffic surcharge and rapid ground water draw down or displacements and any other external loads.
t. Limits and requirements for drainage features beneath, behind, or through retaining structure.
v. Backfill requirements for both within and behind retaining structure.
w. Requirements for special facing panels, module finishes, colors, and/or protective coatings.
x. Governing sections of construction specifications.

.

CHAPTER 12: DRAINAGE

Inplace Drainage Structures

On projects where inplace manholes or catch basins are likely to be either adjusted or reconstructed, the following additional information is necessary from survey crews.

Design or type of structure
Cone Type A, B or C.
Height of adjusting rings – if no rings, indicate this
Height of casting

This information is also necessary when the design requires connecting new drainage structures to inplace structures. Please inform you District Surveys Engineer of these requirements.

Also, during review of supplemental agreements, we noticed several agreements had to be processed due to the incorrect size of existing storm sewer pipes in the plan. A more careful check, especially those pipes that require extensions, is in order.

Drainage Flow Arrows

Plans should contain drainage flow arrows on the plan sheets indicating the direction of flow for culverts, bridges, ditches, ditch breaks, etc..

Chinook Winds and Winter Snows

A combination which frequently results in hazardous winter conditions on shaded portions of roadways under bridges. Icing conditions are a danger in themselves, and they present further hazards during corrective maintenance operations. Paradoxically, they melt away maintenance funds. Potentially hazardous conditions and rising maintenance costs often can be prevented by thoughtful design. Hydraulics Engineers, request that designers place catch basins in such a manner so that runoff in gutters can be intercepted before it can flow under bridges to freeze in those shaded areas. This is a relatively simple design concept which, if employed wherever feasible, will not only reduce recurring maintenance cost, but may also prevent bodily harm and property damage. All surface design features should be carefully evaluated to minimize or prevent, where possible, the flow of water across pavement surfaces. This is especially important in the case of water from winter thaws. For example, snow and ice accumulations on raised islands thawing, and then freezing on the road surface, might be prevented by use of a drained, depressed island.

Grates

The type of grate used with a catch basin does affect the amount of runoff intercepted along a curb and gutter. The location of the catch basin, whether on a slope or at a low point, also should be considered when choosing the type of grate to be used. The advantages and disadvantages of some of Mn/DOT grates are as follows:

Grate	Advantages	Disadvantages
Standard Plate 4154 (vane type) (Grate Casting 816)	1. Tends not to plug with debris. 2. Intercept large flow Depths on steep slopes with No flow across grate. 3. Bicycle safe when installed In correct position.	1. Has less capacity at low Points than parallel grate Std. Plate 4153.
Standard Plate 4152 (vane type) (Grate Casting 814)	1. Bicycle safe 2. Accommodates foot traffic debris. 3. Accommodates more runoff at low points than other grates.	1. Tends to plug with debris 2. Water will tend to skip Across grate with large with large flow depths on Steep slopes.

The above information indicates that the vane type grate (Standard Plate 4154-Grate Casting 816) should be used on grades. The parallel type grate (Standard Plate 4153 - Grate Casting 815) is recommended at low point except where bicycle traffic is expected. If the low point structures may have bicycle traffic, the vane grate (816) is recommended.

Pipe Gauges

Standard Plate 3041. This plate allows a lighter gauge metal pipe above 36 in. (900 mm) diameter than Standard Plate 3040. Therefore, it is better not to show any gauge within a plan unless a heavier than standard gauge is required (lighter than standard are never used). When a heavier gauge is called for, it should be subnoted as below:

2501.511 48 in. (1200 mm) C.S. Pipe Culvert, 10 gauge (1)
(1) A 10 gauge is required per Standard Plate 3040 or a 12 gauge per Standard Plate 3041.

NOTE: (1) above is assuming that the gauge requirements are based on fill conditions only. If a heavier gauge is desired for velocity - durability reasons, note (1) above should state that regardless of which plate is used, a 10 gauge pipe is required.

Standard Plate 3022

Standard Plate 3022 shows two design options (No. 1 & No. 2). When using this plate the designer should indicate on the drainage tabulation which option was used to determine the length of pipes.

Classes for Reinforced Concrete Pipe Arch

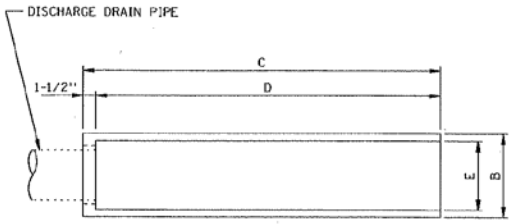
Class IIA is the only class available for pipe arches with a nominal span less than 1855 mm (73 inches). For pipe arch sizes 73 in. (1855 mm) or greater, Class IIA, IIIA and IVA are available. Refer to Standard Plate No. 3014 (M3014) for further information.

Headwalls (Polyethylene option)

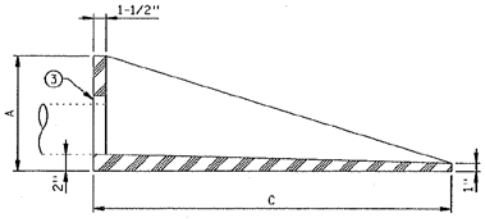
The headwall detail shown below shall be considered an unapproved standard detail to be used for headwalls for subsurface drains. The intent is to use P.E. as an option to the concrete headwall we currently use. Sub note CONCRETE HEADWALL pay item to read: THE CONTRACTOR HAS THE OPTION OF USING A POLYETHYLENE HEADWALL AS SHOWN ON SHEET ____.

This detail can also be found on ProjectWise at

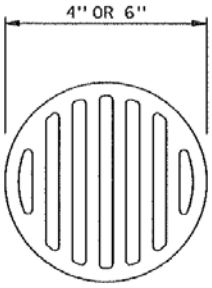
OTS\DesignStandards\DesignDetails\Development\headwall_dd.dgn



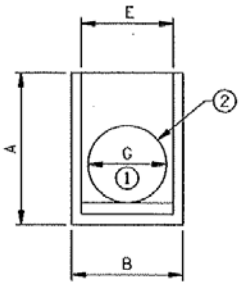
PLAN



SECTION



P.V.C. GRATE



END VIEW

DIMENSIONS	4" DIA. PIPE	6" DIA. PIPE
A	11-3/4"	13-3/4"
B	7"	10"
C	36"	42-1/2"
D	34-1/2"	41"
E	5-1/2"	8-1/4"
F Δ	1 - 2"	1 - 2"
(1) G	5"	7"
APPROX. WT.	38 LBS.	45 LBS.

Δ WALL THICKNESS - SIDES, BOTTOM, AND END.

NOTES:

SEE PLANS FOR MORE INFORMATION.

HEADWALL TO BE RECYCLED HIGH DENSITY POLYETHYLENE, TENSILE: 3.2 k P.S.I. MINIMUM, FLEXURAL 100 k P.S.I. MINIMUM.

(1) HOLE SIZE TO ACCEPT ALL COMMONLY USED P.V.C. PIPE.

(2) P.V.C. GRATE FOR POLY APRON IS COMMERCIALLY AVAILABLE AS A FLOOR STRAINER. SHIELD IS FASTENED TO THE OUT FALL PIPE WITH 2 (TWO) NO. 10 X 1 INCH GALVANIZED SHEET METAL SCREWS.
OPTION:
SCREENS OF 2 OR 3 MESH, 16 GAUGE OR HEAVIER HOT DIPPED GALVANIZED CARBON STEEL WIRE. FITS SNUGLY TO SIDES AND BOTTOM AND IS BENT TO FIT SECURELY TO THE BACK OF THE ENDWALL. ALLOWS FOR APPROXIMATELY 1-1/2" - 2" EXTENSION OF OUT FLOW PIPE.

(3) SEAL P.V.C. PIPE WITH SILICONE CAULK OR OTHER APPROVED MATERIAL

Plastic Pipe Option for Storm Sewer and Side Culverts

Mn/DOT has agreed to include acceptable pipe materials within its construction plans. It has been determined that plastic pipe should be used more uniformly statewide for storm sewer and culverts if the plastic pipe design criteria are met. This is being provided in response to industry concern that plastic pipe, although an approved material was not being included as a bid alternate. Designers may continue to specify a particular product to be used when professional engineering judgment determines that circumstances warrant. When this is the case the designer should keep written documentation in the project file on why the option was not used.

Plastic pipe should be used in accordance with Technical memorandum No. 07-04-B-01.

Storm Sewer

In order to make it clear which pipes shall have options, it is recommended that for each reach of pipe that the options should be noted in the drainage tabulation. On the Statement of Estimated Quantities the listed pay item will be reinforced concrete pipe. A note shall be provided on each appropriate pay item noting that: **Plastic pipe may be used as an option.**

For storm sewer systems where some of the sewer pipe qualifies for the plastic pipe option and the rest of the sewer is concrete, the pay item should have a note on the estimate sheet showing how much pipe may be plastic.

Example:

2503.511 600 mm (24") RC PIPE SEWER CLASS III (1) LIN FT (m) 500
(1) Plastic pipe may be used as an option for 200 lin. ft.. See tabulations for locations.

Centerline Culvert

In order to make it clear which pipes shall have options, it is recommended that for each reach of pipe that the options should be noted in the drainage tabulation. On the Statement of Estimated Quantities the listed pay item will be reinforced concrete pipe. A note shall be provided on each appropriate pay item noting that: Plastic pipe may be used as an option.

Side Culvert

As with the storm sewer it is recommended that the tabulation for side culverts note those that will have options. As presently done in the Statement of Estimated Quantities the listed pay item will be a generic pipe culvert and generic apron with a note indicating the applicable pipe options as indicated in the **Design Scene (chapter 2) Plastic Pipe Option for Culverts** write up.

The necessary requirements pertaining to the use of plastic pipe for side culvert are available in the Special Provisions under Spec. 2501 Pipe Culverts.

Other

Plastic pipe is dependent on soil interaction for support. Adequate compaction must be attainable for the pipe to perform satisfactorily. Areas of high groundwater or unusual soil conditions may not be suitable if compaction is not certain. Follow the design criteria in the Technical Memorandum which provide guidance on acceptable pipe sizes, cover requirements, allowable

ADT for centerline culvert, and other considerations. Designers need to apply engineering judgment in such situations and limit the types of pipe materials allowed if site conditions may result in an unsuccessful installation.

Questions

Any technical questions regarding the usage of plastic pipe should be directed to the State Hydraulics Engineer; any questions about incorporating plastic pipe into the plans should be directed to the Design Liaison Engineer.

Culvert Aprons in the Clear Zone

Several designers have shown a confusion with when to use safety aprons and or grates. They should refer to Chapter 8 of the Road Design Manual for this information.

CHAPTER 13: TURF ESTABLISHMENT

Erosion Control Plan

The United States Environmental Protection Agency has enacted regulations governing construction storm water runoff. Under these new regulations, all developers and governmental agencies will be required to obtain a permit from the Minnesota Pollution Control Agency (MPCA) for construction activities involving the clearing, grading and excavation of five or more acres of land. In addition, runoff from construction sites may have to be sampled and monitored for water quality compliance.

During discussions with the MPCA regarding the permit, it was indicated that detailed erosion control plans for each project will have to be developed and adhered to. During further meetings with the construction industry it was concluded that erosion control must be designed into the projects. Therefore, effective with the Dec. '91 letting, erosion control plan sheets must be developed by the designer and incorporated into the project plans. Types of projects that will require erosion control plans sheets are projects involving grading, bridge replacement, widening, culvert replacement in waterways and wetlands and excavation of 5 acres (2 ha) or more. Types of projects that don't require prepared erosion control plan sheets are signalization, mill and overlay and minor shouldering work.

The erosion control plan should indicate both permanent and temporary erosion control devices. Thus riprap, sodding, pipe flumes, seeding and mulching may be indicated on the same sheets as the silt fence, hay bales, sediment basins, etc. Pay items must be included for both permanent (Spec. 2501, 2511, 2575, etc.) and temporary (Spec. 2573) erosion control devices. Approximate location and approximate length or dimension of the various devices must be indicated. Even though the methods used to construct certain portions of the project may not be known, estimated locations and quantities of the various temporary devices should still be shown and provided. Actual locations of the devices will be determined by the engineer. Extra emphasis should be placed in areas where construction runoff discharges directly into a river, lake or wetland; or where runoff enters a drainage system which ultimately discharges into such a water body.

Erosion Control Problems

Upon recalling erosion control problems encountered on construction projects, ~~I~~ it can only conclude that drainage design is very critical and has a tremendous impact. For instance, most erosion control questions on the part of construction personnel were related to stabilizing ditch bottoms. In fact, the question most frequently asked by project engineers was "do you think sod will hold?"

Most engineers will elude that runoff volume and velocity are critical. Two of the more noteworthy excerpts of conversation as examples are as follows:

> "The water came through that culvert so fast that the scour hole formed 20 ft. (6.1 m) from the end of the apron", said the project inspector.

"Do you have any idea how much water is coming off that field and feeding into our ditch?" The project engineers asked. "No", I said as I scanned over the adjacent seemingly endless acres of field and meadow.

"Well," the project engineer continued, "we placed several cubic yards of riprap into the ditch and after the first 2 in. (50 mm) rain, most of it ended up in the next county." Many times we overlook ditch depth or vertical control as it affects drainage and ultimately, erosion. A couple of the more noteworthy examples of this are as follows:

"The road was doing just fine," the project engineer said, "until we dug that ditch at the toe of the slope. After that, the inslope slipped, and now you can see a crack in the roadway. The ditch acted as a relief trench." and -

"How can we stabilize that ditch?" asked the project inspector. "We intercepted the groundwater and now the banks are wet and keep caving."

Two important points are:

1. Water velocity and volume are critical and after establishing roadway grades, make sure to check ditch grades and the distance drainage will be carried.
2. Vertical control also is very important because it affects ditch depths and the amount of runoff feeding in from adjacent areas.

Sodding Concepts

Sod is one of the most frequently asked about erosion control materials that is used on highway roadsides. Questions range from where to provide, how much and type of sod.

For certain applications, the use of sod on highway roadsides has changed in recent years. However the concept of providing sod in the plans has remained the same for probably forty (40) years. Quantities of sod used have changed over the years and type of areas sodded have also. Most of these changes are the result of the type of construction. For instance, during the years of interstate work, most sod was used strictly for erosion control purposes. The interstate standards called for sodding wider ditch bottoms. In addition, flat roadway grades frequently resulted in large cuts and sodding steep off-take ditches. Very little, if any, sod was used adjacent to residential or commercial areas. However, must of the construction we are now designing is on the regular trunk highway system. Frequently, construction will be conducted adjacent to residential areas, businesses, entrances to towns or even trunk highways that may function as boulevards.

From the foregoing discussion, one may conclude that sod is used for erosion control purposes and also, for beautification purposes. A third use is to establish immediate cover. Examples of these three uses are as follows:

Sodding Types (continued)

Use	Examples	Discussion
Erosion Control	Ditch bottoms, flumes, low side of super-elevated curves, around drainage structures.	The amount of sod used for erosion control purposes has remained fairly steady and the guidelines in the Road Design Manual, Section 8-5.0 is current. We are looking at using other types of materials around isolated rural drainage structures. Sod should not be provided in the plans as an incidental item to a structure because of the sod maintenance period required in Specification 2575.
Beautification	Rest areas, urban projects Adjacent to residential or Businesses	The amount for beautification purposes have changed. Many times in prior years, we would sod large slopes. We don't want to sod these slopes because maintenance forces cannot mow the areas and the sod will smother and die out. We would rather seed and mulch urban slopes. Sod should still be provided adjacent to residential areas and business. However it should be provided for the areas that can be mowed and properly maintained.
Immediate cover	Rest areas, narrow strips adjacent to shoulders on steep inslopes (retrofit widening projects)	This application fluctuates because of the "make fit" projects on existing right-of-way. For lack of a better method, sod may be used in a narrow band to hold a steep inslopes. The sod dies out due to winter salting and smothering; however, the sod does function as an erosion control, mat, provides immediate protection and spreads out the runoff. It is not a good situation, but one that designers and construction personnel have to deal with.

As designers, our biggest challenge is to design our projects appropriately for the area and to blend the project into the area by preserving the natural features. Proper design features and the use of natural materials such as sod, are the most effective means of erosion control.

Topsoil Storage and Slope Rounding

On some projects there was insufficient right-of-way or construction easement to provide for economical topsoil storage during grading operations. In the situations I observed, the contractor had to load and haul the material out and then haul it back in. The preferred method would have been to windrow the material just beyond the construction limits. In those situations where the material could not be windrowed because of terrain, the preferred method would have been to push it into a pile nearby. By so doing, the topsoil can be more easily reapplied on the slopes and both time and money can be saved.

Right-of-way or construction easement is also needed at the top of cut slopes to obtain proper rounding and to minimize erosion. Therefore, Section 4-8 of the Road Design Manual states that, "where backslopes are 1:3 or steeper, generally it is desirable to provide for a distance of 20 ft. (6.1 m) between the P.I. at the top of the backslope and the R/W line, providing it is feasible and any property required in addition to the basic width can be reasonably obtained."

In addition, right-of-way for rounding at the top of all backslopes, regardless of steepness, is indicated on the Standard Plan Sheet 5-297.404 included on all grading projects. Rounding at the top of back slopes is especially critical for spreading out surface runoff and also for establishing a vegetative cover.

In conclusion, make sure when construction limits are turned in that areas required for rounding the slopes are included and so indicated. For those areas where right-of-way cannot be obtained, construction easements should be pursued.

Modified Seed Mixtures

Modified seed mixture information should be shown in the Special Provisions rather than in the Plan.

State Seed Mixes

Standard seed mixtures used by Mn/DOT, BWSR, and some divisions of the DNR have been revised and consolidated into one list of State Seed Mixes. Standards for the mixes have also been combined, with both BWSR and Mn/DOT requiring that mixes be sold as pure live seed (PLS), Source Identified (Yellow Tag) when available, and specific labeling requirements. Requirements for local origin seed will vary depending on the project goals and seed availability. Mixes are available to meet the most commonly encountered erosion control and restoration needs. If one of the standard mixes does not meet the requirements of a particular project, an upcoming manual Site Specific Native Grassland Seed Mix Design Methodology for Minnesota will provide an easy method for creating a custom mix.

Seed mix numbers provide information about the use and content of the mix. This numbering system can be used to guide the user in choosing the right mix for a given project. A full list of the State Seed Mixes and guidelines about their function and intended planting areas will be available on the Mn/DOT website by searching for "Seed Mixes."

Numbering System for State Seed Mixes

The following table shows how mixes are numbered according to native/nonnative species, function, intended planting area, required hydrology, and version.

Native/Nonnative		Function		Planting Area		Hydrology		Version
10,000	Hybrid	1,000	Cover Crop	100	statewide	10	general	1-9
20,000	Introduced	2,000	Mid Term Stabilization	200	South 1/2 & West 1/3	20	dry	1-9
30,000	Native	3,000	Stormwater Facilities	300	NE & North-central	30	dry mesic	1-9
40,000	Custom	4,000	Wetland	400	NW*	40	mesic	1-9
		5,000	Grassland	500	SW*	50	wet mesic	1-9
		6,000	Woodland	600	SE*	60	seasonally flooded	1-9
				700	Central**	70	saturated	1-9
						80	emergent	1-9
						90	submergent	1-9

*Use a mix for Planting Area 200 if no regional mix is available for Planting Areas 400- 600.
*Use a mix for Planting Area 200 or 300 if no regional mix is available for Planting Area 700.

Example: Need a native seed mix suitable for a wetland area next to a stream in Lake County? The table would give you 34-3xx. Under hydrology, there are 9 choices, but only two are listed in the table of seed mixes available: 34-361 (Riparian NE) or 34-371 (Wet Meadow NE). Best professional judgment will be needed to determine which one is best for the project.

List of State Seed Mixes

Guidance on functions and intended planting area for each mix will be available on the Mn/DOT web page by searching for "Seed Mixes."

CATEGORY	NUMBER	PLS Rate	NAME	REPLACES
Cover Crop				
	21-111	100	Oats Cover Crop	MNDOT 110, BWSR UT1
	21-112	100	Winter Wheat Cover Crop	MNDOT 100
	21-113	110	Soil Building Cover Crop	MNDOT 130
Mid-Term Stabilization				
	22-111	30.5	Two-year Stabilization	MNDOT 150

22-112	40.0	Five-year Stabilization	MNDOT 190
Non-Native Grassland			
25-121	61.0	Sandy General Roadside	MNDOT 240
25-131	220	Low Maintenance Turf	MNDOT 260
25-141	59	Mesic General Roadside	MNDOT 250
25-142	45	Agricultural Roadside	MNDOT 280
25-151	120	High Maintenance Turf	MNDOT 270
Mid-term Stabilization Native			
32-241	38	Native Construction	BWSR U12, BWSR U11
Stormwater Facilities			
33-261	35	Stormwater South and West	MNDOT 310 & 328
33-262	44	Dry Swale / Pond	BWSR W4
33-361	35	Stormwater Northeast	BWSR W7, MNDOT 310 & 328
Wetland			
34-171	5.3	Wetland Rehabilitation	BWSR WT3
34-181	5	Emergent Wetland	BWSR W1
34-261	31.5	Riparian South & West	BWSR R1
34-262	14.5	Wet Prairie	BWSR W3, MNDOT 325
34-271	12	Wet Meadow South & West	BWSR W2
34-361	31.5	Riparian Northeast	BWSR R1
34-371	12.5	Wet Meadow Northeast	BWSR W2N
Native Grassland			
35-221	36.5	Dry Prairie General	MNDOT 330
35-241	36.5	Mesic Prairie General	MNDOT 350
35-421	11	Dry Prairie Northwest	BWSR U2
35-441	11	Mesic Prairie Northwest	BWSR U1
35-521	12.5	Dry Prairie Southwest	BWSR U4
35-541	12	Mesic Prairie Southwest	BWSR U3
35-621	11	Dry Prairie Southeast	BWSR U6
35-641	12	Mesic Prairie Southeast	BWSR U5
Woodland			
36-211	34.5	Woodland Edge South & West	BWSR U7
36-311	33.5	Woodland Edge Northeast	BWSR U13, BWSR U14
36-411	35.5	Woodland Edge Northwest	
36-711	35.5	Woodland Edge Central	

Once the new spec book is published it will contain the new pay items to use. Until then these will all be paid for under….

2575.608 SEED MIXTURE SPECIAL ……..……POUND (kg)
2575.608 SEED MIXTURE SPECIAL 1 ……POUND (kg)
2575.608 SEED MIXTURE SPECIAL 2……..……POUND (kg)

CHAPTER 14: GUARDRAIL/BARRIERS

Guardrail Terminals at 6 in. (150 mm) Curb

A potential problem is created when a guardrail end treatment is used where 6 in. (150 mm) curb is inplace. Since a flared terminal is placed with a 4 ft. (1.2 m) flare, a considerable length of guardrail is more than 9 in. (230 mm) behind the face of the curb, thus causing a condition under which an errant vehicle could hit the curb and vault over the guardrail. When a tangent terminal is used, the extruder box is 9 ½ in. (241 mm) closer to the traffic lane than the guardrail. This means then even if the guardrail is set the maximum 9 in. (230 mm) behind the face of the curb, the extruder box will be partially in front of the face of the curb. This results in the possibility of the extruder box being hit by a passing vehicle or, more probable yet, a snow plow.

The problem mentioned above can be eliminated by the following action. When a flared terminal is installed behind 6 in. (150 mm) curb, the curb should be ground down 3 in. (75 mm) to a height of 3 in. (75 mm) beginning at a point 20 ft. (6.1 m) in advance of the guardrail nose and continuing to Post No. 8, a total distance of 58 ft. (17.7 m). When a tangent terminal is placed behind 6 in. (150 mm) curb, the extruder box should be placed a minimum of 9 in. (230 mm) behind the face of the curb. The first 50 ft. (15.2 m) of guardrail needs to be in a straight line angled towards the curb and slightly kinked between Post Nos. 9 and 10. Beyond this point it would be parallel with the curb. The curb should be ground down 3 in. (75 mm) to a height of 3 in. (75 mm) beginning at a point 10 ft. (3 m) in advance of the extruder box and continuing to Post No. 9, a total distance of 60 ft. (18.3 m).

As an alternate to grinding down the curb, it could be removed and replaced with D 424 curb and gutter. On overlay projects, no correction of the curb is necessary if the thickness of the overlay at the curb face is such that no more than 4 in. (100 mm) of curb remains exposed.

When a tangent terminal is used with 4 in. (100 mm) curb or where there is no curb the configuration described above should also be used. However, in the latter case, the 9 in. (230 mm) minimum setback of the extruder box should be measured from a straight line extending forward from the face of the guardrail at Post No. 9.

Impact Attenuator Barrels

Engineering Cost Data and Estimating Unit is responsible for determining reasonable prices for supplemental agreement to construction projects alerted us to the fact that our past practice has been to have a pay item for these barrel attenuators as an assembly, perhaps ten (10) barrels comprising an installation (assembly).

If a second or third installation was required on the project, with a different number of barrels, we could have 2 or 3 pay items. Also, if these installations are used for traffic control, the contract reads that the contractor would replace any units at his expense. This is difficult for a contractor to bid.

We will use impact attenuator barrels, (each). If additional barrels may be needed for replacement, include a quantity for this and subnote the item on the estimate sheet. The cost of

each barrel has been coming out the same, regardless of the amount of sand/salt required. If a paved area is required, it should be allowed for separately. The attenuator should be shown in the plans per past practice, the number of barrels, spacing and weight of sand/salt shown.

Portable Precast Concrete Barrier

PPCB, (Type III), Standard Plate No. 8337 is for temporary usage only. It is not designed to be used for a permanent barrier.

The Type III PPCB is required on many bridge construction sites and their immediate approaches (normally, 36.6 m (120 ft.) adjacent to the bridge end) when the PPCB is designated as the means of protecting the construction site. The Type III barrier will also be required along deep drop-offs immediately adjacent to lanes used to carry traffic. Type III PPCB is required for major maintenance work on bridges, which will take a considerable length of time and if a positive barrier is needed.

Adequate flare (desirably about 1:10) or end protection, such as a crash cushion, to prevent impact with exposed barrier ends must continue to be provided.

Guardrail End treatments

Mn/DOT has requested and received a Public Interest Finding for the specification of w-beam guardrail terminals for use on State Trunk Highways.

The Public Interest Finding allows Mn/DOT to specify one of the following w-beam terminals for exclusive use within a specific highway corridor, the plans must state as a note on either the estimate quantities table or the tab sheet:

Tangent Terminal: Shall be either ET-2000 or SKT-350

Flared Terminal: Shall be either SRT-350 or FLEAT-350

Guardrail Replacement

The following information is meant to be tips for designers to better facilitate installation in the field.

The designer should make a site visit for each installation. It might be a good idea to take pictures. The designer should be aware of the design requirements.

During the site visit, particular attention should be paid to the following:

- -existing geometrics, especially entrance slopes (was the original installation done properly?)
- -condition of material around the installation (is there considerable erosion?)
- -will the existing conditions allow installation without grading work?
- -make an estimate of grading materials required to make the installation proper. (a good field estimate will do, no cross sections are required)

-closely review the affect grading will have on drainage
-will grading require culvert extensions, etc.?
-check for existence of utilities

Include pipe extensions, appurtenances, and treatments in estimate of quantities.

Break down grading quantities to individual pay items, rather than incidental, etc. (some of these applications can result in considerable quantities of grading material)

-this will ensure that bidders are actually including this in their bids.
-it will relieve our project people from paying premium prices for later contract adjustments

Guardrail – Plate Beam Pay Items

The following are pay items to be used in dealing with plate beam guardrail involving wood and steel posts and end treatments. Remember each situation is different and not all pay items may be required or additional items may be needed. Design Specials (first 25' off the ends of bridges) are not covered in this write-up.

1. When removing plate beam guardrail (including posts and end treatment) and will not be reusing the guardrail but replace the existing system with new, use the following items:

   2104.501 Remove Guard Rail – Plate Beam
   2104.509 Remove Anchorage Assembly – Plate Beam (providing there is one inplace)
   2104.509 Remove *specify end treatment* (i.e. twisted end, energy absorbing, etc…)
   2554.501 Traffic Barrier Design B8338 (steel posts)
   2554.501 Traffic Barrier Design B8307 (wood posts)
   2554.521 Anchorage Assembly – Plate Beam (if required)
   2554.523 End Treatment – *specify* (see below)

2. When removing plate beam rail only (posts remain) and will not reuse the rail (this is used if the rail was hit or in poor condition and the District has decided that the wood posts are in good condition and would like to keep the wood post system), use the following items:

   2104.501 Remove Guard Rail
   2104.509 Remove Anchorage Assembly (providing there is one inplace)
   2554.521 Anchorage Assembly – Plate Beam (if required)
   2554.602 Guardrail Post (if required)
   2554.603 Plate Beam Rail

3. When there is a run of plate beam guardrail with wood posts and the rail is in good condition, the District may opt for salvaging the rail and replace the wood posts with steel posts, if this is the case use the following items:

   2104.509 Remove Anchorage Assembly (providing there is one inplace)
   2104.521 Salvage Guard Rail (add note to estimate: Includes the removal of the wood posts.)

2554.521 Anchorage Assembly- Plate Beam (if required)
2554.603 Install Guard Rail (add note to estimate: Includes the Furnish and Install of steel posts)

END TREATMENTS

4. There are details available on the server both in Metric and English for the following end treatments, which should be placed into the plans. These details are propriety end treatments and should not be modified or signed.
   Tangent Terminal - (ET-2000 and SKT-350)
   Flared Terminal - (SRT-350 and FLEAT-350)

5. Use these pay items:

   2554.523 End Treatment - Tangent Terminal (Include details in plan)
   2554.523 End Treatment - Flared Terminal (Include details in plan)

6. EXCEPTION (**FLARED TERMINAL ONLY**):
   The SRT-350 only comes with wood posts. The FLEAT-350 is the only flared treatment that has steel posts. So, if the District wants to have a flared terminal with steel posts, then the following pay item should be used:

   2554.523 End Treatment - Energy Absorbing Terminal (add note to estimate: Shall be flared and have steel posts.

   If this situation is used alone (no other end treatments) in your plan then **Do NOT** include the detail in plan for a flared terminal. If you are using this item along with the End Treatment – Flared Terminal pay item then the details for the flared terminals should be included in the plan.

7. When removing or salvaging an existing guardrail end treatment (you know what it is) then use ….
   2104.509 Remove Energy Absorbing Terminal
   2104.509 Remove Breakaway Cable Terminal
   2104.509 Remove Slotted Rail Terminal
   2104.509 Remove Eccentric Loader BCT
   2104.523 Salvage Energy Absorbing Terminal
   2104. 523 Salvage Breakaway Cable Terminal
   2104. 523 Salvage Slotted Rail Terminal
   2104. 523 Salvage Eccentric Loader BCT
   2554.602 Install Energy Absorbing Terminal
   2104. 602 Install Breakaway Cable Terminal
   2104. 602 Install Slotted Rail Terminal
   2104. 602 Install Eccentric Loader BCT

   And add a note of what they are.

If, however it is an instance where the contractor will be salvaging a guardrail end treatment as a result of staging cross traffic. Then use…

2104.523 Salvage Tangent Terminal *
2104.523 Salvage Flared Terminal *
2554.602 Install Tangent Terminal *
2554.602 Install Flared Terminal *

*Note as 4 above.

8. If anyone ever has any questions regarding guardrail, end treatments and/or pay items included in your plan, please contact the Design Support Engineer or the Standards Engineer prior to completing your plan. It is much easier having a plan come in with the correct information than try to correct it later.

Short Radius Guardrail

Whenever the guardrail includes a short radius around an entrance, driveway, or side road it will require a special short radius detail.

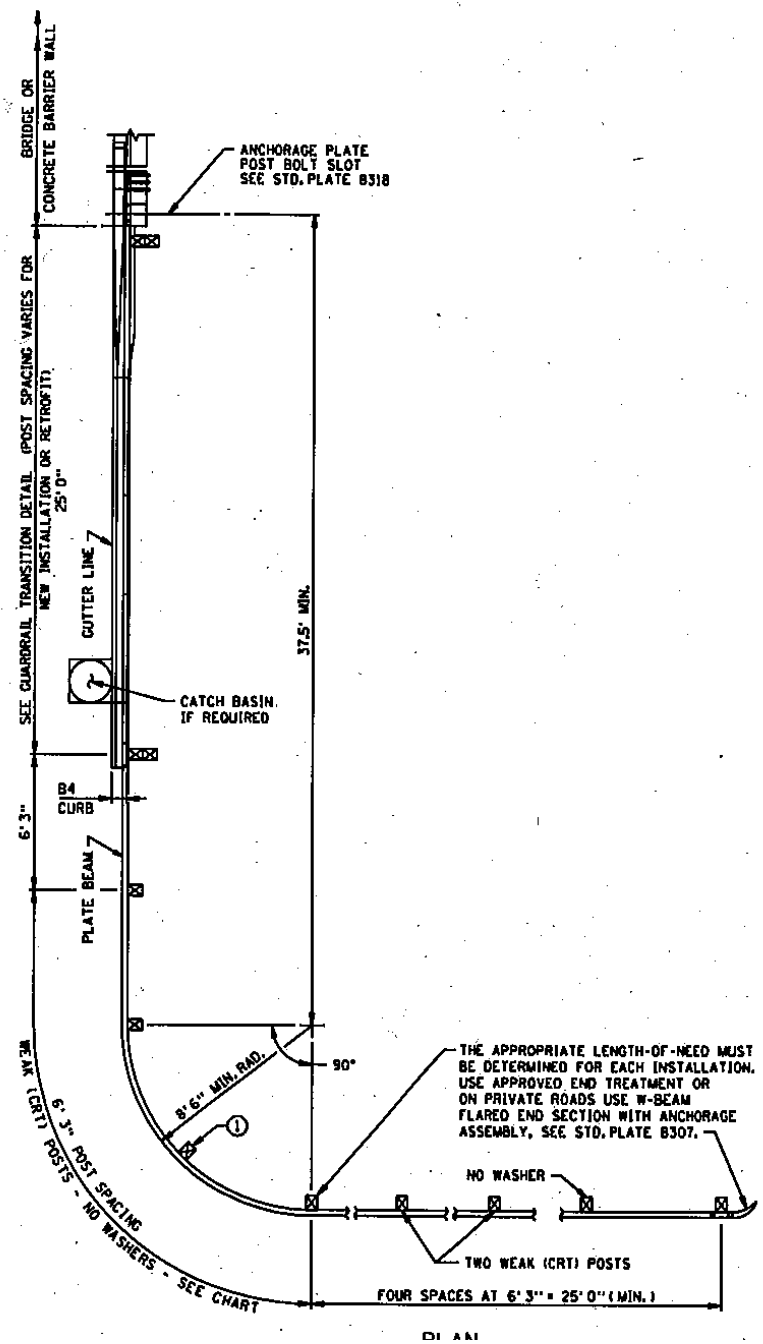
This is considered an unapproved standard detail and shows the use of wood posts. This would require the use of item 2554.501 TRAFFIC BARRIER DESIGN A8307 or 2554.501 TRAFFIC BARRIER DESIGN B8307 by the LIN FT.

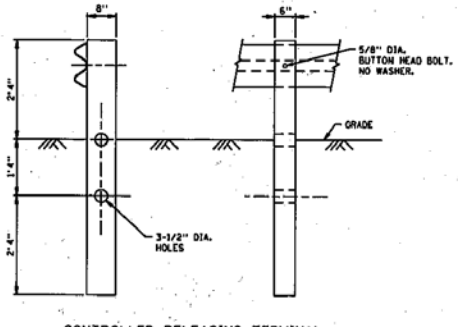
If the designer prefers to use steel posts then he/she needs to add the following two notes to the detail…

1. All posts shall be steel.
2. All weak (CRT) posts shall be bolted hinged posts (steel plug welded posts may be used as an option).

The detail can be found on ProjectWise at

OTS\DesignStandards\DesignDetails\Development\shortrg_dd.dgn or can be seen below…





CONTROLLED RELEASING TERMINAL WEAK (CRT) POST

NUMBER OF WEAK (CRT) POSTS AND GUARDRAIL RADIUS

NO. OF POSTS	APPROXIMATE RADIUS
4	8'-6" ①
5	12'-0"
6	16'-0"
7	20'-0"
8	24'-0"
9	28'-0"

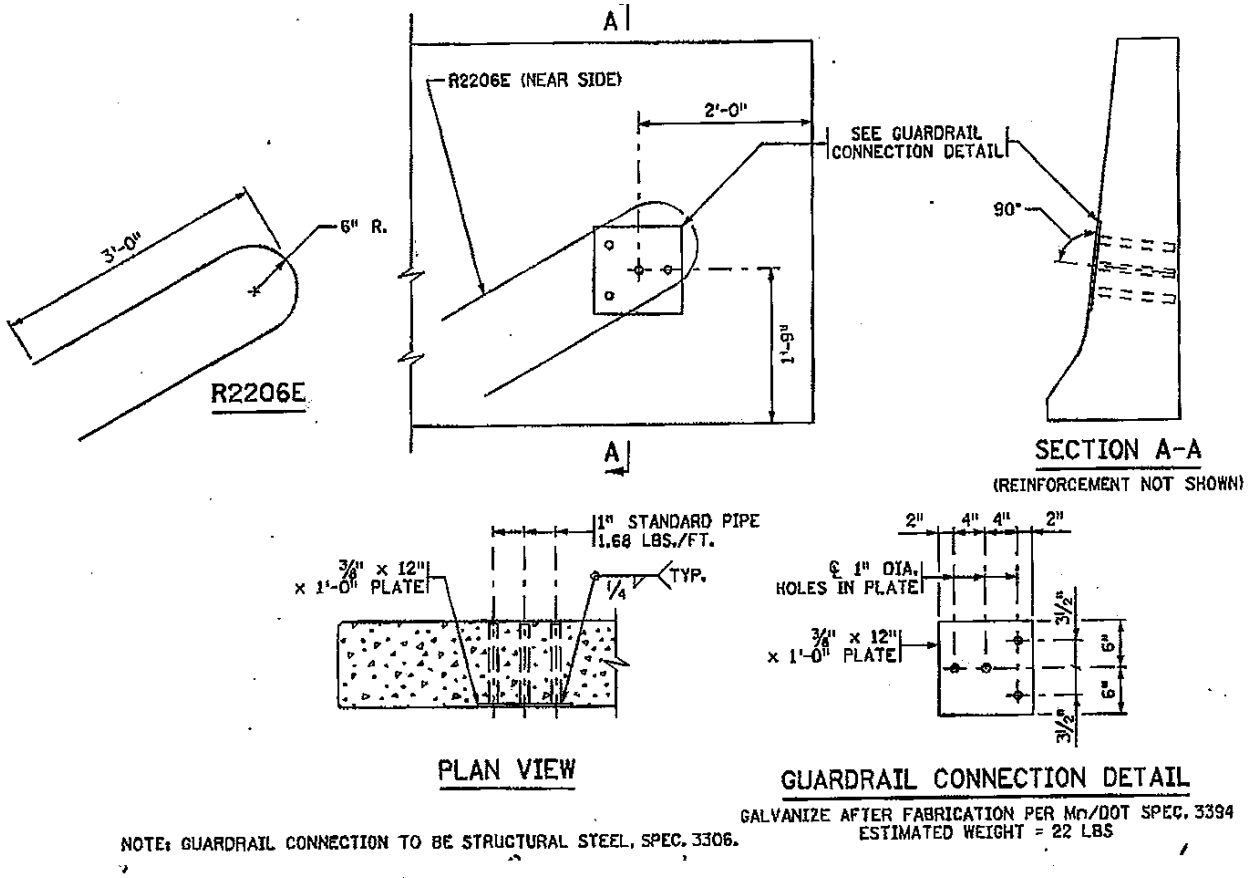
① NO BOLT ON CENTER POST.

NOTE: SEE SPEC. 2554.

NOT NCHRP 350 APPROVED

Barrier

When attaching guardrail to concrete barrier you need to take into account the connection to the barrier. The detail below is an example of one such detail you would need to add to the plan….



Concrete End Post

The One-Line Bridge Rail End Post as shown on Standard Plan .609 & .619 has been modified to remove specific structural and reinforcing details regarding the end post. The primary intent of these standards is to show the guardrail transition and connection.

Designers will need to work with the Bridge Office to develop specific end post details and reinforcing on a "case-by-case" basis for all new projects that require use of these standard plan sheets. The Office of Project Management and Technical Support is working on a proposal to get a new "stand alone" end post crash tested in accordance with current crash test requirements.

CHAPTER 15: FENCING

Snow Fencing

Blowing and drifting snow for most Minnesotans that phrase conjures up images of windblown landscapes where roadways disappear, weather forecasters warn of life threatening conditions, and highway heros drive big orange trucks. On an average winter Minnesota taxpayers spend 100 million dollars annually on snow and ice control. Mn/DOT alone typically spends 41 million dollars annually on snow and ice control.

Blowing and drifting snow is a transportation efficiency and safety concern. The effects have impact on Minnesota's economy as well as it's public safety. Within Mn/DOT a snow control steering committee was established to assess Mn/DOT's role and internal expectations and advocate the tools available to solve the blowing and drifting snow problem. What are the tools available for solving the blowing and drifting snow problem?

The tools available include living snow fences, structural snow fencing, raising the grade of the roadway, and flattening the backslopes along the roadway. Each one of these choices needs to be balanced among personal, social, economic, and environmental values in order to select the best solution.

A survey of county and state snow plow operators revealed that there are 1,000 mi. (1609.4 km) of problem roadway, 550 mi. (885.1 km) on the county highway system and 450 mi. (724.2 km) on the state trunk highway system that require retrofitting to solve the blowing and drifting snow problem. Retrofitting a problem section of roadway after the design and construction of the roadway is completed presents many challenges. Those challenges deal largely with the logistics having to go back, a second time, to the adjacent landowners and acquire a property right to implement a snow control practice. Also, traffic flow is enhanced for the traveling public when we solve the blowing and drifting snow problem along an entire corridor.

The first step in solving snow deposition problems is to identify sections along the roadways that the highway maintenance crews know are subjected to blowing and drifting snow. Snowplow operators are also helpful because they are familiar with what types of problems are typically encountered on a given section of roadway, such as upwind drifting, downwind drifting, poor visibility, or slush and ice build up on the road surface.

More information regarding snow fences can be found at…

www.dot.state.mn.us/environment/livingsnowfence/index.html

CHAPTER 16: TRAFFIC

Interim Pavement Markings - Item 2580

There has been confusion regarding the use of this pay item and the quantities to be included. A group has been reviewing the use of interim markings and several problems have been identified. This pay item should only be used for same day pavement markings to be placed on bituminous lifts and milled surfaces. Striping for detours or full striping of the project for suspensions should be paid for under pavement marking (2582) pay items. (Normally paint).

Interim markings do not include edge lines and the length of the skip will be 5 ft. (1 m) with a 45 ft. (9 m) gap. Quantities must include centerline marking for each lift including any milled surfaces. For two lane, two way roads, quantities for the no passing zones need to be included. These quantities are kept on record in the District Traffic Offices. When being paid for by the linear foot, the plan needs to indicate how many lifts were estimated, the amount of solid yellow line, yellow broken line (skip) and white broken line (skip).

If the interim markings are being paid for by the lump sum this information is not included in the plan but will be in the submittal letter.

In either situation, the plan must contain the detail for the interim pavement markings.

Traffic Control Tabulations

To assist the estimating unit, designers are encouraged to use tabulations to quantify traffic control devices in the Plan.

Wet Reflective/Wet Recoverable Markings

There has been a request to have specific pay items for the wet reflective/refractive pay items so that they can track where these items are used and to obtain historical price data on them.

Therefore, when the plan contains wet reflective/refractive pay items the following should be used on the Statement of Estimated Quantities….

2582.602 PAVT MSSG *(usual striping pay item description)*PAINT (WR) by EACH
2582.602 PAVT MSSG *(usual striping pay item description)*EPOXY (WR) by EACH
2582.603 *(usual striping pay item listing size, style, color)* - EPOXY (WR) by LIN FT
2582.603 *(usual striping pay item listing size, style, color)* –PAINT (WR) by LIN FT
2582.618 CROSSWALK MARKING – PAINT (WR) by SQ FT
2582.618 CROSSWALK MARKING – EPOXY (WR) by SQ FT

These liquid wet reflective or wet refractive items are required to be ground-in per Technical Memorandum No. 08-10-T-02. It is suggested that you note on the SEQ or tab if they are NOT ground-in.

For the temporary wet reflective/refractive markings the standard pay items will continue to be used.

Permanent wet reflective/refractive Poly-Preform tape is presently NOT allowed on MnDOT projects.

Overhead Sign Numbering

The old system of numbering (OH 10-35W) is just not holding up to today's needs for data and electronic friendly labels. We've found that there is a need to switch to a format that will allow us to sort and filter in many different computer applications. The old and new labels still contain the OH unique ID number. However, the numbers are switched around (highway will now come first) and we've added the MN, US, and I labels in front of the highway number.

Here are a few examples of how the new format will look:

Old Format:	OH 20-35W	OH 100-100	OH 35-90
New Format:	I35W-020	MN100-100	I90-035

The change is effective immediately and will start showing up in construction plans. A few examples on how various parts of the plan will look are attached (tabulations, sign panel layouts, roadway sheets). Note that the MN, US, and I labels are not shown in construction plan sheets.

Attached is the updated Standard Sign Drawing for the OH Sign Identification Plate. The website is updated with the revised sheet.

http://www.dot.state.mn.us/trafficeng/signing/signingplansheets.html

The OH ID plates that are currently in the field should be changed through attrition. Since the unique ID number has not changed, only the format, there is no need to rush replacements.

Radius Corners on Type D signs

Currently, there is a standard note that is placed on the Type D Sign Panel Layouts in the Signing Plan. It states: "Corners of the sign panels extending beyond the border shall not be trimmed."

The MNMUTCD allows for corners of sign panels to be trimmed. Please remove the above note from all future plans for Type D signs.

It is important to note that by removing the note in the construction signing plan, it does not mean that all MnDOT Type D signs are required to have the corners trimmed. It simply means that if Type D signs are manufactured with the corners trimmed MnDOT will accept them.

Temporary Pedestrian Access Control

A wide range of pedestrians can be expected at work sites, including the young, elderly, and people with disabilities such as hearing, visual, or mobility. These pedestrians need a clearly delineated and usable travel path.

Technical Memorandum No. 10-02-TR-01 "Adoption of Public Rights of way Accessibility Guidance" dated February 11, 2010 and the Minnesota MUTCD Part 6D address these issues.

MnDOT has begun the development of guidance for Temporary Pedestrian Access Routes (TPARs) with new 2011 layouts added to the Minnesota Temporary Traffic Control Zone Layouts - Field Manual. These pages may be downloaded in pdf format. A shop-drawing of the newly approved MnDOT Type IV ADA Pedestrian Barricade as shown in the 2011 Field Manual, is also available online. This barricade has not been crash-tested, and should only be used on or adjacent to walkways.

If the TTC zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided. If the TTC zone affects an accessible and detectable pedestrian facility, the accessibility and detectability shall be maintained along the alternate pedestrian route.

Consideration should be made to separate pedestrian movements from both work site activity and motor vehicle traffic.

It is strongly encouraged to pay for this as…
2563.601 TEMPORARY PEDESTRAIN ACCESS CONTROL by the LUMP SUM.

However, the ADA Office recommends making TPAR on mill and overlay projects incidental unless there are multiple curb line changes which require removal of large areas of pavement.

When TPAR is not practical pinch the staging timelines so that pedestrian facilities are interrupted for as little time as possible.

CHAPTER 17: CROSS SECTIONS

Earthwork on Cross Sections

Just some miscellaneous comments on cross section development.

If it is easier to computer plot cross sections with a one inch square grid, it is acceptable. It would be helpful to name an elevation noted in the sketch, such as a ditch elevation.

Another general comment on cross sections. Generally it is better if earthwork quantities are shown on the cross sections. This provides a general check on the quantities.

Cross Section/Utilities

A reminder that when your plan design requires that utilities be shown on the cross sections you need to also show the existing and new R/W. These requirements are stated in the Utilities manual which can be found at….

http://www.dot.state.mn.us/utility/files/pdf/policy/utilities-manual-web.pdf

CHAPTER 18: GENERAL NOTES

Design Guidance & Information

The Design Support Unit recently gave a presentation to the Metro Division titled "Guidance and Information for Designers". As directed by the district it began with general information. Then it covered the two most common areas of confusion for designers…Drainage and Guardrail. The second portion of the presentation covered common errors in the areas of the plan that are rated. Followed by some general areas of misunderstandings.
There were several handouts at the presentation as well…Drainage Checklist, Guardrail Checklist, and Review Checklist. These handouts are the guidance that the Design Support unit gives to its rotating graduate engineers to assist them with what to look for when checking plans. The PowerPoint presentation and three supporting handouts can be found at …
http://ihub/ots/pre-letting/design/

Tracking changes to Special Provisions

Because of problems in the field of modifications to the Special Provisions by both contractors and field personnel, we will now start indentifying those changes in the proposals.

When preparing and submitting draft special provisions please follow the following process:

Start by downloading the most current SP2005.

(A) If you want to use a C.O. SP 2005 write-up of an item but WILL NOT be making any changes within the write-up, then do the following:

Show Section Name and number

Example:

S-X (1904) EXTRA AND FORCE ACCOUNT WORK
SP2005-47

You may either show all of the words or just show the Section Name and Number. When you leave the SP2005-Number intact, this will indicate to the Special Provisions Unit that you have not changed the section and want the most current write-up.

(B) If you want to use a C.O. SP 2005 write-up, but WILL be making changes within the write-up, then do the following prior to sending us your file:

Show Section Name and SP2005 number, followed by "modified".

Example:

S-X (1904) EXTRA AND FORCE ACCOUNT WORK
SP2005-47 - modified

Show all the words, including your revisions. Make it as easy as possible for the Special Provisions Unit to recognize your changes. You may choose to show your revisions in italics, a different color, or highlight. Or you may use "Track Changes" (Please add a note to the header indicating your chosen method).

If you DO NOT show the sections as "modified", the Special Provision Unit will most likely assume you want the current section from the SP2005. So, you may not get what you want.

How these changes will be shown in the final proposal is still being studied.

Proprietary Items In Plans

As you are aware, proprietary items are those items specified that have less than 3 known manufacturers. Whenever a proprietary item is specified, Mn/DOT is to write a letter to the FHWA (PS&E Projects) or the file (all other projects) stating why it is in the public interest to use that brand name item. It is very difficult for us in the Central Office to know why a proprietary item must be used. We therefore request that when designers specify a proprietary item, they prepare a memo indicating why this product was chosen. Reasons may be to match and existing system or design constraints.

Send the memo to the Special Provisions Engineer as soon as possible. The Special Provisions Engineer will work with the FHWA on the Public Interest Finding (PIF).

Definition of Install

There has been some confusion recently on the definition of "Install". Whenever the word "install" (or variation thereof) is used it implies that the materials are being supplied (or are from salvaged items). If this is the case then using the word "install" by itself is correct.

If however, the materials are not being supplied (or are not from salvaged items) then one of the following words (and/or their variation) should be used…. place, construct, furnish & install.

Incidental Work vs. Included In Work

Because of conditions unique to a project, a pay item may include work that is not described by the standard specifications. Designers must anticipate these conditions and provide for them in the plans with a note. Additional work might be considered included in the cost of an existing pay item and can be provided for with a note if the scope of the work is directly related to an existing pay item, and is short in duration or low in cost.

"Directly related" to an existing pay item generally means either the work is performed on that item or is a direct result of the work on that item.

"Low in cost" frequently is assumed to mean less than $1000.

For example, if the plans require a new sewer pipe to be tied into an existing pipe, the cost of tying in the pipe could be considered incidental

When bidding, a contractor must be made aware of pay items involving incidental work so that the bid price for the item can be adjusted to compensate for the additional cost. Therefore, it is desirable to include all notes for incidental work in the footnotes of the Statement of Estimated Quantities.

Work for which *no direct payment* is to be made is included for payment in one of two ways:

1. If the Method of Measurement or Basis of Payment defined in the Standard Specifications for Construction for the pay item *describes the work as included*, the work *is* included in a specific pay item. Then a note is written as a footnote to the Statement of Estimated Quantities for the pay item that describes the work, so it can be estimated accurately, and uses the word "included or includes." For example, the placement of a 45˚ elbow with the construction of a 18 in. (450 mm) CS Pipe Culvert is included for payment as illustrated by the next Statement of Estimated Quantities and the note provided as a footnote to that tabulation.

STATEMENT OF ESTIMATED QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
2104.501	REMOVE PIPE CULVERTS	Lin Ft (m)	432
2104.509	REMOVE PIPE APRONS	EACH	78
2104.509	REMOVE STAIRS	EACH	2
2104.521	SALVAGE SPRINKLER SYSTEM	Lin Ft (m)	325
2104.521	SALVAGE CHAIN LINK FENCE		765
2501.511	18" (450 mm) CS PIPE CULVERT (1)	Lin Ft (m)	256
2503.541	30" (750 mm) RC PIPE SEWER	Lin Ft (m)	13

(1) LENGTH OF PIPE INCLUDES 1 - 45˚ ELBOW

The Method of Measurement of the pipe length defined by the Specifications for the pay item 2501.511 __" (__ mm) CS PIPE CULVERT *includes* the length of the elbow. Therefore, the elbow *is* included in the specific pay item 18" (450 mm) CS PIPE CULVERT," but the contractor needs to know the dimensions of the elbow in order to prepare a bid.

2. If the work *is not described* as included by the Method of Measurement or Basis of Payment defined in the Standard Specifications for a pay item, the work may be *made* incidental. Then a note is written as a footnote to the Statement of Estimated Quantities for the pay item that describes the work, so it can be estimated accurately, *and* uses the words "this shall be considered incidental." Or just "incidental" For example: the removal of a bulkhead from an existing pipe sewer and the connection of a 30 in. (750 mm) RC Pipe sewer to the existing pipe

is included for payment by placing a note as a footnote to the statement of Estimated Quantities:

STATEMENT OF ESTIMATED QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
2104.501	REMOVE PIPE CULVERTS	Lin Ft (m)	432
2104.509	REMOVE PIPE APRONS	EACH	78
2104.509	REMOVE STAIRS	EACH	2
2104.521	SALVAGE SPRINKLER SYSTEM	Lin Ft (m)	325
2104.521	SALVAGE CHAIN LINK FENCE	Lin Ft (m)	765
2501.511	18" (450 mm) CS PIPE CULVERT (1)	Lin Ft (m)	256
2503.541	30" (750 mm) RC PIPE SEWER (2)	Lin Ft (m)	13

(2) REMOVAL OF INPLACE BULKHEAD AND CONNECTING PIPE TO INPLACE PIPE SHALL BE INCIDENTAL.

The removal of the bulkhead and the connection to the inplace pipe is *not* described in either the Method of Measurement or in the Basis of Payment for the pay item 2503.541 __" (__ mm) RC PIPE SEWER.

Another example of indicating Incidental work this way on the Statement of Estimated Quantities is a small amount of work directly caused by completing other work that is a pay item, such as the replacement of a few trees and shrubs disturbed only by the salvaging of a sprinkler system (a pay item).

STATEMENT OF ESTIMATED QUANTITIES			
ITEM NO.	DESCRIPTION	UNIT	QUANTITY
2104.501	REMOVE PIPE CULVERTS	m (Lin Ft)	432
2104.509	REMOVE PIPE APRONS	EACH	78
2104.509	REMOVE STAIRS	EACH	2
2104.521	SALVAGE SPRINKLER SYSTEM (3)	m (Lin Ft)	325
2104.521	SALVAGE CHAIN LINK FENCE		765
2501.511	450 mm (18") CS PIPE CULVERT (1)	m (Lin Ft)	256
2503.541	750 mm (30") RC PIPE SEWER (2)	m (Lin Ft)	13

AT BRIDGE OFFICE CENTER (13100 JESSICA BLVD.). TREES AND SHRUBS WHICH ARE REMOVED SHALL BE REPLACED WITH EQUAL SIZE AND TYPE. THIS WORK SHALL BE CONSIDERED INCIDENTAL.

Lump Sum Items

The term, "lump sum," when used as a unit of measurement for payment, means complete payment for that item of work *as described by the contract.* A description of the work to be paid

for as a “lump sum” is included in the plans so that contractors bidding on the project will know exactly what work and materials are included in the pay item. These “lump sum” items usually include work items that are used on many projects. Either a bill of materials has been developed for them (such as standardized traffic control or traffic control interconnection systems) or they are routine work items that do not vary significantly from project to project (such as maintenance or restoration of haul roads).

Clear definition in the plan of what is expected in each case contributes to harmony and better results at less cost during construction. More accurate estimates are promoted as well. If the estimated quantity of an item is such that it cannot be determined at the design stage an item and quantity should be set up in the estimate and proposal to establish a contract bid price. However, there is no good substitute for careful research and determination of reasonably accurate quantities. Pursuing this a bit further - occasionally a plan provides for direct payment for certain items yet advises bidders that certain like items of unknown quantity required to be furnished by the contractor as included in one thing or another will not be measured for payment. This can only be disadvantageous to the state. The bidder must again include a sufficient sum somewhere in his proposal to cover the costs of the unknown quantity to protect themself and then still demand direct payment of the engineer. How can direct payment be justified for the known quantity but not for the unknown. Better to provide that the unknown quantities will be paid for at the appropriate contract price. Gives estimators a break, too. The preceding cases are even more confusing when the extent of the unknown quantities is subject to “as direct (or ordered) by the engineer.”

Disadvantaged Business Enterprises and Targeted Group Business

All State funded Construction Contracts have Veterans Preference and Veterans Goals.
-For further information regarding these requirements, please contact Mn/DOT’s Rights Office.

Unacceptable Plans

There are complaints that some plans are sent in with white out and/or stick up material on the originals. These materials cause problems with our reproduction procedures and plans processing. The use of these materials should not be used on the originals that are sent to the Central Office.

Supplemental Agreements

A review of the recent listings of supplemental agreements reveals that a fair number of them could possibly been avoided if the designers would have given additional consideration of possible field conflicts when the roadway and roadway structures are under construction. It is difficult under the design stage to consider all of the problems that construction may encounter when the designer is under pressure to get the “plan out”. However it is also difficult and costly for the construction engineer and contractor to negotiate an agreement to re-design parts of the project when it is under construction. If time permits it would be beneficial if the plan was reviewed by the construction engineer before it is completed.

Examples of some of the problems:

1. Conflicts with utilities - storm sewers intercepting underground utilities. This is a common occurrence.
2. Borrow item for select granular material behind a retaining wall was inadvertently left out.
3. Topsoil borrow item missing. This happens in municipal areas where topsoil is scarce within the project limits.
4. During construction there was unanticipated encounters with building foundations, floors, septic tanks, etc. This usually happens in municipal areas. An item such as excavation special could possible have been considered.
5. There seems to be excessive use of removable tape for traffic control. This material is expensive and the designers should be aware of its utilization.

Addendum Signature Block

A signature block is required on a plan sheet that is added or revised by an addendum. When a new plan sheet is added to the plan by addendum, the sheet shall be numbered with "A", "B", "C" etc. (i.e. Sheet No. 63A of 63). Revised plan sheets: When a plan sheet is deleted and a revised plan sheet substituted by an addendum, the revised sheet shall be numbered with a "R" (i.e. Sheet No. 62R of 62).

Drafting Standards

In order to produce a copy, which when microfilmed, would be at the highest possible clarity and resolution, the designer should keep in mind the following requirements for good reproduction.

1. Uniformity
2. Large open lettering
3. High density of drafted lines
4 Good contrast

A large percentage of our plans do have these qualities, but improvement is needed in the remainder.

Contractors Crossing of Railroads

The following article was written by the Railroad Negotiations Section to provide additional guidance to designers for contractors crossing of railroad tracks.

"The designer should review the need for a contractor to cross the railroad tracks. This information must be passed on to the Railroad Administration Office in order that agreements or other arrangements can be made. Please note that the agreement process can take three to six months. When proper notice is not provided, lettings can be delayed."

When a highway contractor works on railroad property, such as where bridge construction would involve equipment working on or crossing railroad property, the contractor can not trespass on railroad property or any other private property without meeting some special requirements.

It is the designer's responsibility to determine whether or not the contractor will be required to work on railroad property - (which is outside the right-of-way) and to notify the Land Management and Administration Office of the potential problem so that agreements, if necessary, can be executed prior to bid letting.

Changing Project Scope

Projects are usually reviewed in the preliminary design stage for effects on historical or archaeological properties. If the project design has been modified since that review such that project limits or areas of construction have been expanded, the project should be submitted for re-review. Contact you District Preliminary Design Engineer at least several months in advance of the letting date in order to avoid last minute problems, which could delay the letting.

Municipal Agreements for State-Let Projects

A municipal agreement (or cooperative construction agreement) is prepared in advance of the advertisement for a letting. In order to meet the letting and award date, the agreement submittal must be turned in to the Municipal Agreements Unit preferably 12 to 14 weeks prior to letting, and no later than 9 weeks. This timeline is essential so that the local agency can have sufficient time to approve the agreement at their council or board meeting, and to allow Contract Management and Department of Administration time to approve and execute the agreement prior to the award of the construction contract.

The agreement submittal consists of the estimated quantities and estimate for the local participation, sufficient plan sheets depicting this information; such as layouts, tabs, construction details etc., the plan title sheet, and any correspondence or computations identifying the costs and the maintenance. The agreement may consist of a schedule "I", a lump sum on bids, a lump sum, a composite percentage, or a combination of any of these.

Road Design Plans Final Checklist

The following checklist was created to help designers when they produce their plans to ensure they don't miss anything….

Road Design Plans Final Checklist

ROAD DESIGN
PLANS FINAL CHECKLIST

S.P._____ Date_____

LOCATION_____

_____

_____

PRE-DESIGN REVIEW

___1. Correspondence
___2. Design Study Report
___3. Design Layout
___4. Correspondence
___5. Soils Recommendations
___6. Cooperative Agreements

_____

_____

TITLE SHEET

___1. Beginning and End of Project
___2. Length of Project Based on _____Roadway
___3. Equations
___4. Scales
___5. County, Township and Range
___6. Gravel Pits and Pit Data
___7. Design Speed
___8. Tier Standard
___9. Title Block (Correct Signature)
___10. Spec. Note
___11. Federal Project No.
___12. Work Description
___13. Index
___14. Exceptions
___15. Temporary Connections
___16. North Arrow
___17. State Aid No.
___18. Legislative No.

_____

_____

GENERAL LAYOUT SHEET

___1. Section Corners
___2. Beginning & End of Project & Exceptions
___3. Sheet No., Station to Station
___4. Balance Points
___5. Traffic Counts
___6. Legend
___7. Equations
___8. Typical Sections
___9. Turn Lanes
___10. Earthwork Tabulations
___ 11. Road Designations
___12. Reference Points
___13. North Arrow
___14. Cities and Corporate Limits
___15. Bridge Numbers
___16. Gravel Pits & Borrow Pits
___17. Stockpile Sites
___18. Mitigation Ponds
___19. At Grade Railroad Crossings
___20. Temporary Bypasses
___21. Temporary Connections
____ 22. Beginning & Ending Construction

_____

_____

ESTIMATE SHEET

___1. Item No. Against Computer Printout
___2. Construction Notes for Applicability
___3. Quantities Against Computations, Item Sheets & Plan Sheets
___4. Tabulated Quantities & Plan Sheets
___5. Standard Plates – Nomenclature and Applicability
___6. Plan Quantity Items (P)
___7. Not Plan Quantity Items (X)
___8. Pit Data
___9. _____

Road Design Plans Final Checklist (continued)

TABULATED QUANTITIES (Use on Estimated Sheet – plan must stand on these quantities)

___1. Surfacing Tabulations
___2. Earthwork Tabulations
___3. Clearing & Grubbing
___4. Sodding & Mulching
___5. Miscellaneous Tabulated Quantities
___6. _____

TYPICAL SECTIONS

___1. Check Against Recommendations (Soils, etc.) (Corrected Letter)
___2. Check Notes for Applicability
___3. Ditch Depths and Slopes
___4. Soils Note (1st Type Sec. Sheet)
___5. Compaction Subcut & Subgrade Treatments
___6. Shoulder Typicals
___7. Swamp Treatments
___8. Turn Lanes
___9. Future Lanes
___10. Check for Minor Misc. Typicals
___11. Bituminous Mix Designations

DETAIL SHEETS

___1. Check Pay Items for Appropriate Special Details Needed
___2. Note Incidental Work Which Applies to Special
___3. Make sure latest version of Standard plan sheets
___4. Sign & show Modifications of Modifed Standard plan sheets.

PLAN SHEETS

___1. Topography
___2. Alignment (Plan Sheet or Tabulations)
___3. Begin & End Project
___4. Begin & End Construction
___5. Construction Centerline
___6. Equations
___7. North Arrow
___8. Borrow Pits, Stockpile areas
___9. Right of Way, Land Lines. Easements & "B" Points
___10. Section, Township and Range
___11. Azimuths or Bearings
___12. Drainage Arrows
___13. Temporary Conditions
___14. Ditch Blocks
___15. Culverts & Direction of Flow
___16. Road & Entrance Radii
___17. Curve No.
___18. Utilities
___19. Wetlands (Identify by Type)
___20. Road Designations
___21. Road Intersection Data (Sta. & Coordinates)
___22. Horizontal control Notes (First Plan Sheet)

PUBLIC UTILITIES SHEET

___1. Check Against Roll & Notes
___2. Check Against Plan Sheets
___3. Check Against Cross-Sections
___4. Utility Ownership
___5. Road Tabulations
___6. Level D Note

Road Design Plans Final Checklist (continued)

PROFILE SHEETS

___1. Super Diagram (Non-Standard)
___2. Equations
___3. Check Special Ditches Against
___ a. Plan Sheets
___ b. Profile Sheets
___ c. Cross-Sections
___4. Check Grade Against Cross-Section
___5. Check Subcuts, Swamp Depths Against Cross-Sections
___6. Check Vertical Curves
___7. Line Designation
___8. Vertical Control Note 1st Sheet
___9. Bench Marks
___10. Conventions
___11. Balance Points
___12. Run Profile Grades & Check Gradients
___13. Swamp Excavation Areas, Cu. Yd. & Treatment No._____
___14. Culverts with Inlets and Outlets
___15. Subcuts & Subgrades Treatments with Depths
___16. Road Profiles & Entrances
___17. Profile Grade Top of Whatever
___18. Buried Crossings – Gas, Oil, Elec., Power, Tele., & Toll Cables
___19. Gas Line Crossings
___20. Telephone Toll Cable Crossings

DRAINAGE SHEET (Use on Estimate Sheet – plan must stand on these quantities)

___1. Check Design Computations
___2. Check Drainage Against
___ a. Estimate Sheets
___ b. Plan Sheets
___ c. Profile Sheets
___ d. Cross-Sections
___3. Check Storm Sewer Computations
___4. Check Storm Sewer Against:
___ a. Estimate Sheets
b. Plan Sheets
c. Profile Sheets
d. Cross-Sections
___5. Culvert Treatments
___6. Pipe Sewer Backfill
___7. Casting Assembly Schedule
___8. Flumes
___9. Pipe Tie Note
___10. Type "B" Bedding

CROSS SECTION

___1. Equations
___2. Excav. Computed to This Line
___3. Slopes
___4. Entrances
___5. EXC, EMB, Centerline, Stamping
___6. Stationing on Curves
___7. Right of Way
___8 Earthwork Quant. For Culv., Ditch Blocks & Entrances
___9. Balance & Quant. Between Secvt. SG Exc., Reg. & Gran. Fil
___10. Show Bldgs., Foundation & Drainage Inplace
___11. Utilities
___12. Label Regions, Survey & Const. Centerline – 1st Sheet
___13. Label Natural Ground, Profile Grade, Pitch Elev. – 1st Sheet
___14. Check Earthwork Tabs. Against Tab. Sheets

Plan Review – Bidability , Standards, & Consistancy Checklist

The following checklist is a guideline used by the Design Support unit for checking for bidability, standards, and consistency statewide.

"must do" changes

1. __ TITLE SHEET
   - __ Funding
   - __ Correct project numbers?
   - __ Check for omissions and general appearance.(Index map, project length etc…)
   - __ Does it make sense from an outside perspective?
   - __ Is work type appropriate?
   - __ Check signature block for appropriate signatures.

2. __ GENERAL LAYOUT
   - __ Check general appearance. (RR Crossings, Interchanges, Bridges ,City and County limits etc…)
   - __ Does it include appropriate information. (Plan sheet index, Sta. Etc…)

3. __ ESTIMATED QUANTITIES SHEET
   - __ Are pay item numbers, names and units correct?
   - __ Make sure pay items are used correctly according to spec. book and spec. prov.
   - __ Are there adequate/appropriate footnotes and do they make sense?
   - __ Are there references to tabulation sheets shown?
   - __ Cross check tabulated quantities with estimated quantities.
   - __ Coordinate plan changes with special provisions.
   - __ Coordinate with municipal agreements unit for correct column headings (funding).

4. __ STANDARD PLATE TABULATION
   - __ Are plate numbers the most recent?
   - __ Are appropriate plates included?
   - __ Are footnotes appropriate?

5. __ GENERAL OMISSIONS CHECK
   - __ Is there adequate information in the plan to cover all pay items, especially non-standard pay items or items rarely used.
   - __ Check soils letter vs plan

6. __ COORDINATION WITH FUNCTIONAL UNITS
   - __ Check plan sheets prepared by other functional units (such as signals, signing, lighting, TMS) to assure the plan sheets have been incorporated into the main plan correctly and that the functional areas have reviewed the plan sheets.

"should do" changes

1. __ EARTHWORK TABULATION AND SUMMARY
   - __ Review to assure all the items are covered as shown on the typical sections and soils notes. Cross check with pay items.
   - __ Review methodology.

2. __ SOILS AND CONSTRUCTION NOTES
   - __ Review for completeness and consistency

3. __ TABULATION OF QUANTITIES
   - __ Review to the extent that appropriate quantities are tabulated. Do not review actual quantities unless the quantity look high or low.

4. __ TYPICAL SECTIONS
   - __ General review for completeness and consistency.
   - __ Are all construction areas covered?
   - __ Drawn according to latest standards.
   - __ As per soils letter.

5. __ DETAIL SHEETS
   - __ General review for completeness and consistency (is enough info shown?)
   - __ Is bill of material shown for lump sum items?
   - __ Are all details shown in plan or provisions?
   - __ Following appropriate standards?
   - __ Correct guardrail standards are being followed?

6. __ STANDARD PLAN SHEETS
   - __ Are all appropriate sheets included?
   - __ Are the sheets in the plan the latest version?
   - __ If the sheet is modified have the correct procedures been followed?

7. __ CONSTRUCTION PLAN SHEETS
   - __ General review for completeness and readability.

8. __ CONCRETE PAVING PLANS
   - __ General review for latest standards.

1/28/2002

Heads Up

Just a reminder. When designing around or close to an airport, remember that we should be considering vertical clearances. Some things to keep in mind while in the design process should be vertical curves, lighting heights and signing heights.

Process A Plans (RX Maintenance Type Plans)

There seems to be some confusion regarding Process "A" plans. Hopefully the following will help to clear some of that up.

- Generally State funded projects
- No utilities involvement
- All Right of Way requirements have been met (non-encroachment certificates.)
- No new Right of Way required
- No cost share agreements required
- No permits required (except NPDES)
- Three week advertising period
- 8½" x 11" plans preferred
- Typically 20 pay items or less
- 50 plan sheets or less
- State Pre-letting, Land Management, and State Design Engineer's signature not required. The designer's signature is the only required signature on the Title Sheet
  - It would be very helpful if entire plan was submitted in vellum paper.
  - Plan appearance should resemble how Process B plans appear. Please refer to implementation plan.
  - If possible have a design squad review the plan prior to its submittal for processing.

Design Exceptions Need to be Documented

A reminder to keep design exception information with the design file.

Plan Reduction Report (Phase 1)

A task force was formed to recommend ways to reduce the complexity and size of construction plans using Metro's Wakota project as a pilot. The task force was made up of several functional areas. There was also a sub-group made up of many functional areas including several consultants and contractors. Plan content information has also been gathered through a survey of contractors this past spring (2001). This information will be compiled this summer (2001) and place in a design scene fall of 2001. It was determined that Mn/DOT would not only use these recommendations on Wakota but implement several of them as an option to designers statewide.

These are recommendations only and are not required on projects. It is up to the individual districts to determine which recommendations to use on each project.

The following are elements of the plan that were discussed for reduction or elimination and the consensus the task force reached about each issue.

Drainage

Implement the idea of providing drainage tabulations and drainage profiles generated directly through GeoPak Drainage instead of hand/CADD drawn.

Concrete Pavement

It was decided to simplify the concrete paving plan rather than eliminate it all together due to potential contractor bidding issues. The following are items to reduce plan preparation time.

- Quantities should be tabulated
- Plan expansion joints such as E-1, E2-1, E4-1 and all contraction and longitudinal joints do not need to be tabulated or paid for because these are considered incidental.
- Payment for joints should be limited to the following expansion joints E1D-2, E2D-2, E3D-3, E4D-1 and E8H.
- Lane width column on tabulation is not necessary.
- Should provide joint layout detail for non-standard areas. Not necessary to provide joint layout sheets for standard joint layouts.
- Reduce the number of station to station splits in the tabulations. Sections may be combined into larger groupings (i.e. ramp A, ramp B, mainline between interchanges, etc.).
- For further information see Design Scene Chapter 10.

Typical Sections

Typical sections are getting too complicated and too numerous. There should be close coordination between the designers and the materials office in an effort to reduce the number of typical sections. The following are items to help reduce the number of typical sections.

- Use insets as a form of showing depths and to show them only once.
- Use variable sections for minor geometric changes.
- Fewer pavement sections.

Permanent Turf Establishment

The number of various permanent turf establishments combined with the detail provided in the plans has been determined not to be necessary. The following are items to help reduce plan preparation time.

- There will be an effort from the Office of Environmental Services to reduce the number of seed mixtures to 2 or 3 and to simplify the turf establishment within projects.
- Permanent turf establishment tabulations will not be required.
- Plan sheets will still be required. The plan sheets should provide totals of quantities on each sheet.
- Any application rates not shown in the spec. book should be shown either on the estimate, soil and construction notes or tabulation sheet within the plan.
- 10% should be added to each quantity for field adjustments and overruns.

Cross Sections

Every effort should be made to reduce the number of cross sections. This can be done by increasing the intervals between sections where there are minimal changes in geometrics and

quantity calculations are not affected. In most cases, 100 foot (30 m) spacing should be considered as the minimum distance between sections for plan information. Other sections may be necessary for design, but need not be included in the plan except to portray complex grading situations.

General Layout
It was determined that the general layout is not necessary. Caution should be used when eliminating these sheets. The general layout is still a good way of showing the overall picture of the project and can be helpful on complicated projects.

Superelevation Diagrams
It was determined that superelevation diagrams were no longer necessary. Superelevations do need to be shown in the plan. The preferred way is to show the superelevations in plan view on the drainage sheets.

Striping Plan
Effort should be made to minimize striping shown in the plans. Standard striping sheets can be used to cover most striping situations in the plan. Plan views would only be necessary on non-standard situations.

Right of Way
Right of Way should be shown on construction plan sheets and cross section sheets only.

The following items were discussed. However, for various reasons, it was determined these plan sections would be retained in their current format:

- Alphanumeric sheet numbering – this will be tried as a pilot.
- Standardized erosion control sheets.
- Reduce cross section details.
- Reference standard plan sheets – like we do with standard plates.
- Simplify earthwork.
- Eliminate staging detail.
- Eliminate traffic control associated with staging.

Plan Reduction Report (Phase 2)
There has been a thorough study of bridge and roadway construction plan content requirements in an effort to reduce the time it takes to develop plans and the sheets included in the plans. URS consultants were hired to do the study, which was part of an ongoing effort to streamline program delivery processes. An earlier related study for the I-494 & TH 61 Wakota Bridge Project (Phase 1) was completed in April, 2001 and led to this in-depth analysis.

The time and sheet savings will only occur if the accepted recommendations are actually implemented by designers! Please make sure all the appropriate people on your staff are made aware of the information in this summary or see the complete report. Some of the accepted recommendations require good judgment as to when they do or do not make sense on a given plan (i.e., will there be too much “clutter”?). We expect more streamlined plan sets will be the end result!

The following is a summary of the Matrix that was in the full report.

Title Sheet
Use of alphanumeric numbering system is acceptable.

Estimated Quantities
Automate the process for statement of estimated quantities generation, incorporating data into Trans*port.

Typical Sections
No changes should be made in the typical section component content of the plan set preparation at this time, however, the number of typical sections should be minimized. There should be close coordination between the designers and the materials office in an effort to reduce the number of typical sections. The following are items to help reduce the number of typical sections. Use insets as a form for showing depths and to show them only once. Use variable sections for minor geometric changes. Fewer pavement sections.

Proposed Utilities Information requested by Local Agencies Tabulation and Plan
Utilities for the local agencies to be constructed with the Mn/DOT contract. Information should be displayed with the drainage plans if plan sheet clutter is not a problem. No changes should be made in the proposed utility tabulation component of the plan set preparation at this time.

Staging Plans/Traffic Control Plans
Decisions should be on a project-by-project basis regarding the degree of detail in its traffic control and construction staging plans. Combining the traffic control and staging layouts on the plan sheets should also be considered.

Bypass Plan
Show the bypass plan for complex projects. Combine the bypass plans with the staging and traffic control plans for simple projects where applicable and sheets will not become too cluttered.

Inplace Topography
Combine the inplace topography, inplace utilities, inplace drainage, or removals together into one plan section where applicable and sheets will not become too cluttered.

Removal Plan
Combine the inplace utility and drainage plans, inplace topography plans, and the removal plans where applicable and sheets will not become too cluttered.

Construction Plans
No changes should be made in the construction plan component of the plan set preparation for complex projects at this time. For simple projects construction plan content may be modified by combining other plan sections with the construction plans where applicable and sheets will not become too cluttered.

Concrete Paving Plan and Details
Show construction plan details for non-standard concrete paving joints. Remove incidental items from the tabulation. Reduce the number of station to station splits by separating the roadway into areas (i.e.. Ramps, mainline, etc.)

Bituminous Paving Plans and Details
Eliminate the bituminous paving plan and details by presenting the information in the typical sections, construction plans, or construction details.

Superelevation Plans
Present the superelevation information in plan view and combine the superelevation plans with the drainage plans where applicable and sheets will not become too cluttered.

Drainage Plan, Profile and Tabulation
Combine the drainage profiles with the drainage tabulation sheets. Maintain the drainage plan as a separate sheet and include information such as superelevation, turf establishment and erosion control. Do not redraw the GEOPAK drainage profiles for cosmetic purposes only. Eliminate redundant information between the drainage plans, profiles, and tabulations. Drainage profiles should be provided with the tabulation sheets. Also there was no need, besides cosmetics, to redraw drainage profiles from GEOPAK (stick figures). Erosion control information must be provided separately to meet NPDES requirements.

Water Resources Notes
Combine the water resources notes with the drainage details.

Impact Attenuator Plan and Details
Show impact attenuator locations on the construction or staging and traffic control plans where applicable and sheets will not become too cluttered. Details are to be inserted as standard plans.

Traffic Barrier Plans and Details
Combine the traffic barrier plans with the construction plans where applicable and sheets will not become too cluttered. Details are to be inserted as standard plans or tabulated as standard plates.

Fencing Plans
Include the fencing plan on the construction plan where applicable and sheets will not become too cluttered.

Striping Plans
Combine the signing and striping plan sheets except in those instances where it clearly will result in a cluttered plan set

Cross Section Matchline Layout
Remove the cross section matchline layout from the plan set unless the complexity of the project warrants the inclusion of the sheet.

Cross Sections

Display cross sections at 100 foot (30 meter) increments with supplemental cross sections in critical areas. Utilize software (GEOPAK) to automate drawing of inplace and proposed utilities and drainage on the cross sections.

Local Federal Aid on Mn/DOT Let Projects

When a construction project is identified in the STIP for Federal Funding, Mn/DOT encourages local agencies to obtain Federal Dollars to help fund their share of eligible cooperative construction project costs through the ATP (Area Transportation Partnership) process. Information on the ATP process can be found in the STIP (State Transportation Improvement Program) Guidance at the following link:

http://www.dot.state.mn.us/planning/program/atps.html

The ATP solicits for projects that are eligible for federal funding. The resulting project lists are reviewed and integrated into the Area Transportation Improvement Program which is then sent to MnDOT's Office Capital Programs and Performance Measures to be included in the STIP. The final STIP is forwarded to the Federal Highway Administration/Federal Transit Administration for approval.

The federal aid dollars that have been approved for local use through the ATP process must be included in the STIP as a separate line item listing both the federal aid and local funds to be used on the project.

For cooperative construction projects, an agreement and "Schedule I" will be prepared to identify the total local liability, which includes both the federal aid funds and the local funds. The local agency will be invoiced for the local share of the project and Mn/DOT will collect the federal share from the federal government on behalf of the local unit of government.

In the unlikely event that federal aid became unavailable for the local portion of the cooperative construction project; the local unit of government would be responsible for the total local cost liability.

If the State makes changes in the contract construction which affects the local cost portion of construction, the State will inform the local officials of any proposed addenda, change orders and supplemental agreements to the construction contract and any associated local cost changes.

If the local unit of government requests additional work or changes to the work and the State determines that the requested additional work or plan changes are necessary or desirable, the State perform the additional work or plan changes and bill the locals for the additional costs associated with the change.

At completion of the contract and with the determination of final costs, the State will prepare a Final "Schedule I" which will identify the total final local obligation, which includes the local and local federal aid cost shares.