# N.C. DEPARTMENT OF TRANSPORTATION
# Hydraulics Unit

Ditch Detail Changes

Changes to the Hydraulics V8 Workspace ditch details have been made to address deficiencies observed in the field, eliminate superfluous details, as well as make Hydraulics details correct and consistent with the Standard Drawings. (The Hydraulics ORD Workspace will be updated with the modified Details at a later date.)

Summary of Changes
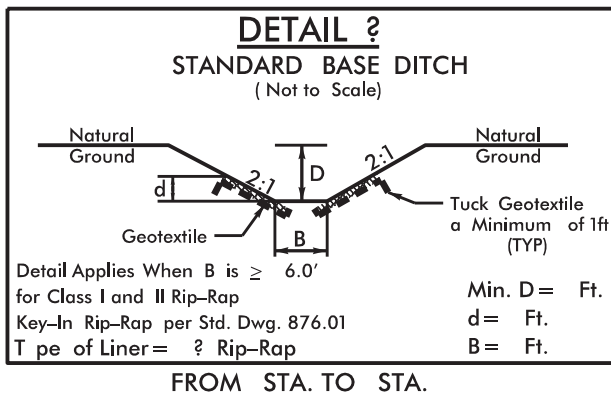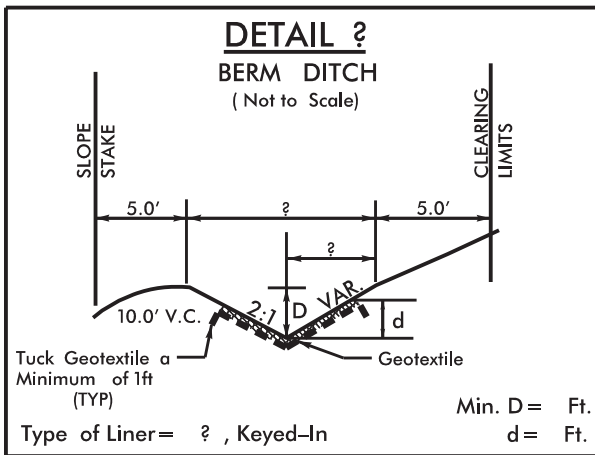

Standard Base Ditch (riprap) (B > 6ft)
- Geotextile under riprap is tucked at the edges
- "Max. d" changed to "d" to prevent too little riprap from being placed
- Asterisk "*" has been clarified for when to use the < 6ft detail versus the >6ft detail
- Reference to Std Dwg 876.01 clarified. (Std Dwg 876.01 to 876.04 to be revised as well)
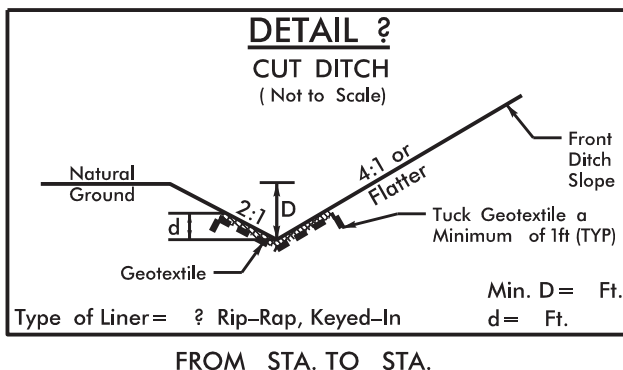
Cut Ditch (riprap)
- Geotextile under riprap is tucked at the edges
- "Keyed-In" added to direct contractor to make riprap flush with ditch bottom
- "Max. d" changed to "d" to prevent too little riprap from being placed

DETAIL ?
BERM DITCH
(Not to Scale)

SLOPE STAKE

CLEARING LIMITS

5.0'   ?   5.0'

?

10.0' V.C.   2:1   D VAR   d

Tuck Geotextile a Minimum of 1ft (TYP)

Geotextile

Min. D = ___ Ft.
d = ___ Ft.

Type of Liner = ? , Keyed–In

FROM STA. TO STA.

Berm Ditch (riprap)
- o Geotextile under riprap is tucked at the edges
- o "Keyed-In" added to direct contractor to make riprap flush with ditch bottom
- o "Max. d" changed to "d" to prevent too little riprap from being placed

DETAIL ?
BERM BASE DITCH
(Not to Scale)

b

Natural Ground

d   2:1   D   2:1   RDWY

B

2:1

Min. D = ___ Ft.
d = ___ Ft.
B = ___ Ft.
b = ___ Ft.

Geotextile   Tuck Geotextile a Minimum of 1ft (TYP)

Type of Liner = ? Rip–Rap, Keyed–In

FROM STA. TO STA.

Berm Base Ditch (riprap)
- o Geotextile under riprap is tucked at the edges
- o "Keyed-In" added to direct contractor to make riprap flush with ditch bottom
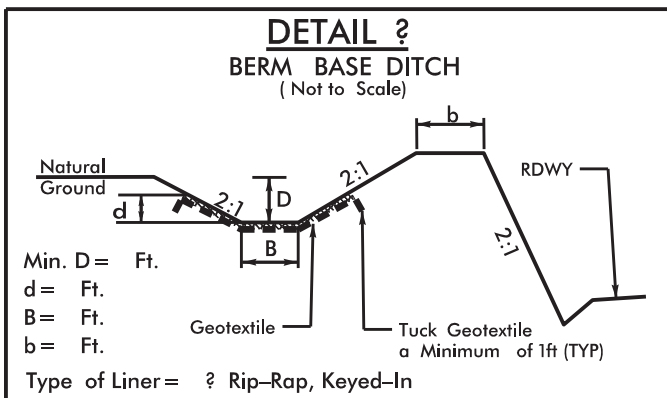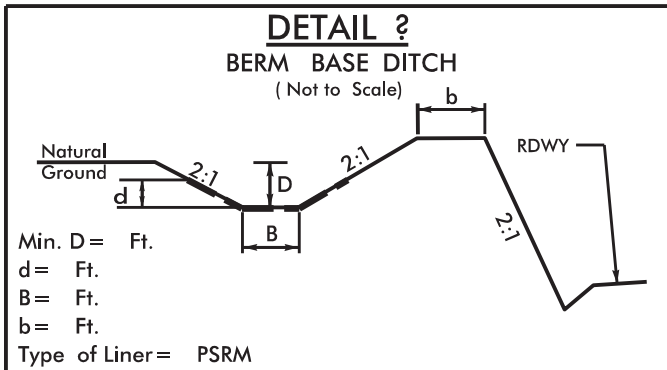- o "Max. d" changed to "d" to prevent too little riprap from being placed

DETAIL ?
BERM BASE DITCH
(Not to Scale)

b

Natural Ground

2:1   d   D   2:1   RDWY

B

2:1

Min. D = ___ Ft.
d = ___ Ft.
B = ___ Ft.
b = ___ Ft.
Type of Liner = PSRM

FROM STA. TO STA.

Berm Base Ditch (PSRM)
- o "Max. d" changed to "d" to prevent too little PSRM from being placed

DETAIL ?
LATERAL 'V' DITCH
(Not to Scale)

b

Natural Ground

2:1   d   D   2:1   1"/Ft.   Fill Slope

Tuck Geotextile a Minimum of 1ft (TYP)

Geotextile

Min. D = ___ Ft.
d = ___ Ft.
b = ___ Ft.

Type of Liner = ? Rip–Rap, Keyed–In

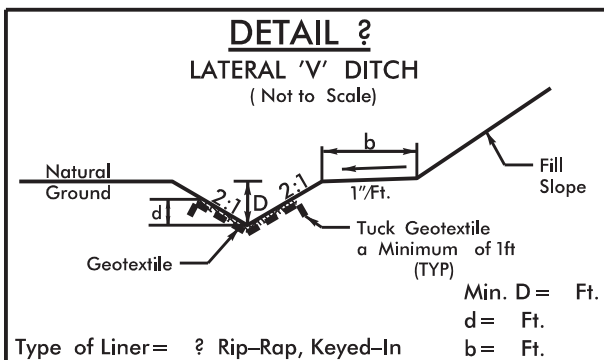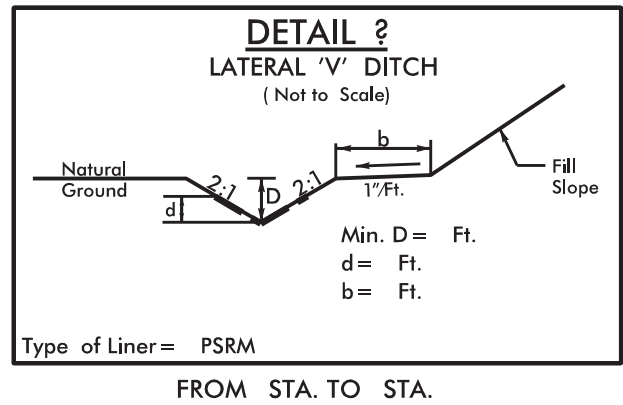FROM STA. TO STA.

Lateral V Ditch (riprap)
- o Geotextile under riprap is tucked at the edges
- o "Keyed-In" added to direct contractor to make riprap flush with ditch bottom
- o "Max. d" changed to "d" to prevent too little riprap from being placed

03/23/23

Summary of Changes

Lateral V Ditch (PSRM)
- o "Max. d" changed to "d" to prevent too little PSRM from being placed

DETAIL ?
LATERAL 'V' DITCH
(Not to Scale)

Natural Ground   2:1 D 2:1   1"/Ft.   Fill Slope
d

Min. D =   Ft.
d =   Ft.
b =   Ft.

Type of Liner =   PSRM

FROM   STA. TO   STA.

Lateral Base Ditch (riprap) (B < 6ft)
- o Geotextile under riprap is tucked at the edges
- o "Keyed-In" added to direct contractor to make riprap flush with ditch bottom
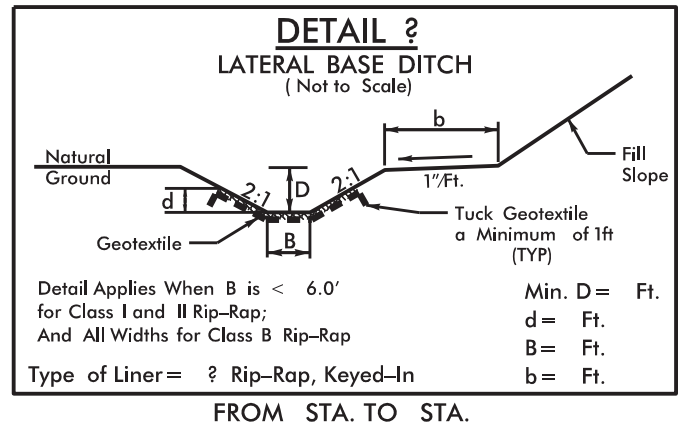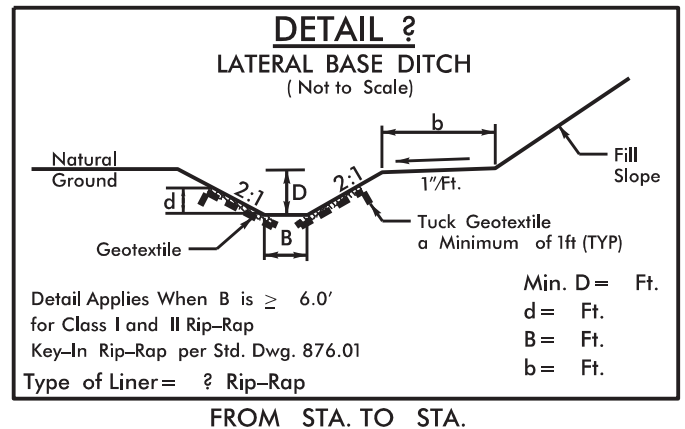- o "Max. d" changed to "d" to prevent too little riprap from being placed
- o Asterisk "*" has been clarified for when to use the < 6ft detail versus the >6ft detail

DETAIL ?
LATERAL BASE DITCH
(Not to Scale)

Natural Ground   2:1 D 2:1   1"/Ft.   Fill Slope
d
Geotextile   B   Tuck Geotextile a Minimum of 1ft (TYP)

Detail Applies When B is <   6.0'
for Class I and II Rip-Rap;
And All Widths for Class B Rip-Rap

Type of Liner =   ? Rip-Rap, Keyed-In

Min. D =   Ft.
d =   Ft.
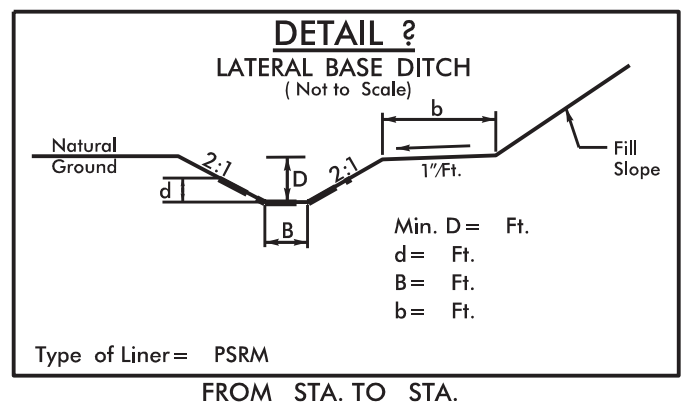B =   Ft.
b =   Ft.

FROM   STA. TO   STA.

Lateral Base Ditch (riprap) (B > 6ft)
- o Geotextile under riprap is tucked at the edges
- o "Max. d" changed to "d" to prevent too little riprap from being placed
- o Asterisk "*" has been clarified for when to use the < 6ft detail versus the >6ft detail
- o Reference to Std Dwg 876.01 clarified. (Std Dwg 876.01 to 876.04 to be revised as well)

DETAIL ?
LATERAL BASE DITCH
(Not to Scale)

Natural Ground   2:1 D 2:1   1"/Ft.   Fill Slope
d
Geotextile   B   Tuck Geotextile a Minimum of 1ft (TYP)

Detail Applies When B is ≥   6.0'
for Class I and II Rip-Rap
Key-In Rip-Rap per Std. Dwg. 876.01

Type of Liner =   ? Rip-Rap

Min. D =   Ft.
d =   Ft.
B =   Ft.
b =   Ft.

FROM   STA. TO   STA.

Lateral Base Ditch (PSRM)
- o "Max. d" changed to "d" to prevent too little PSRM from being placed

DETAIL ?
LATERAL BASE DITCH
(Not to Scale)

Natural Ground   2:1 D 2:1   1"/Ft.   Fill Slope
d
B

Min. D =   Ft.
d =   Ft.
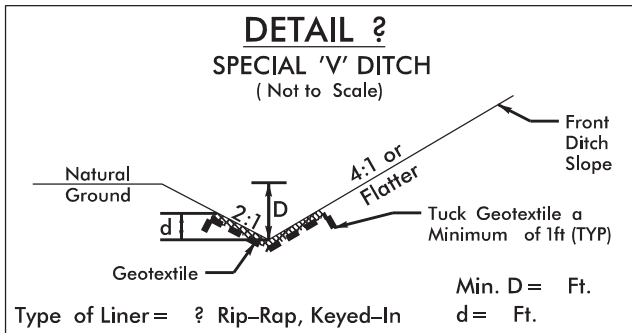B =   Ft.
b =   Ft.

Type of Liner =   PSRM

FROM   STA. TO   STA.

Summary of Changes

Special V Ditch
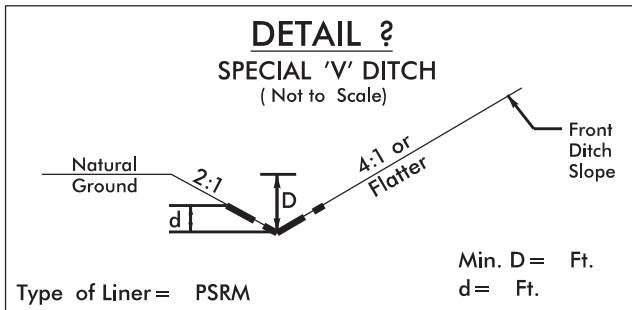- o This is a new detail which combines Special Cut Ditch and Special Lateral V Ditch

Special V Ditch (riprap)
- o This is a new detail which combines Special Cut Ditch and Special Lateral V Ditch
- o Geotextile under riprap is tucked at the edges
- o "Keyed-In" added to direct contractor to make riprap flush with ditch bottom
- o "Max. d" changed to "d" to prevent too little riprap from being placed

Special V Ditch (PSRM)
- o This is a new detail which combines Special Cut Ditch and Special Lateral V Ditch
- o "Max. d" changed to "d" to prevent too little PSRM from being placed

Special Base Ditch
- o This is a new detail which combines Special Cut Base Ditch and Special Lateral Base Ditch

Summary of Changes
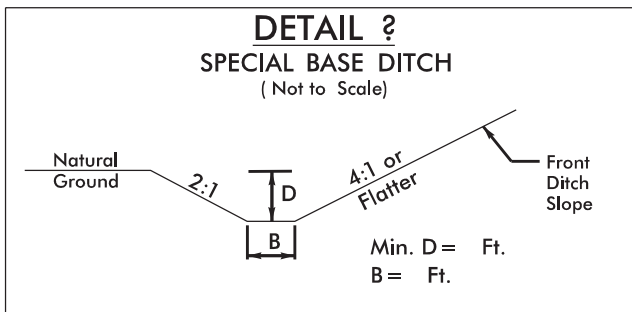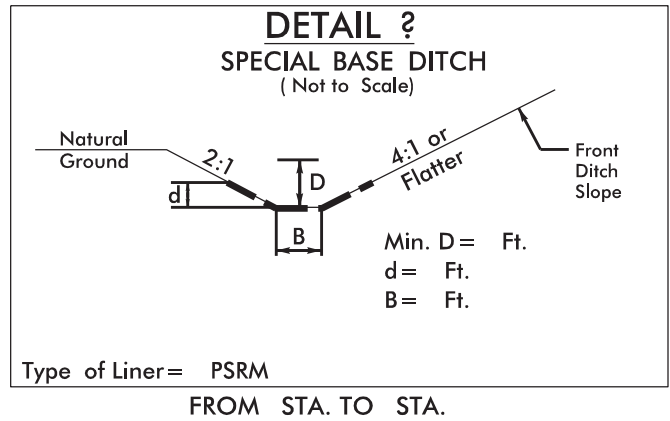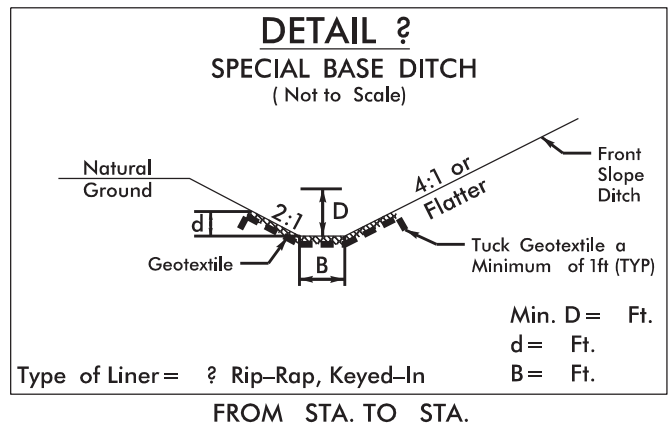
Special Base Ditch (riprap)
- This is a new detail which combines Special Cut Base Ditch and Special Lateral Base Ditch
- Geotextile under riprap is tucked at the edges
- "Keyed-In" added to direct contractor to make riprap flush with ditch bottom
- "Max. d" changed to "d" to prevent too little riprap from being placed

DETAIL ?
SPECIAL BASE DITCH
(Not to Scale)

Natural Ground — 2:1 — D — 4:1 or Flatter — Front Ditch Slope

d — B

Min. D = Ft.
d = Ft.
B = Ft.

Type of Liner = PSRM

FROM STA. TO STA.

Special Base Ditch (PSRM)
- This is a new detail which combines Special Cut Base Ditch and Special Lateral Base Ditch
- "Max. d" changed to "d" to prevent too little PSRM from being placed

DETAIL ?
SPECIAL BASE DITCH
(Not to Scale)

Natural Ground — 2:1 — D — 4:1 or Flatter — Front Slope Ditch

d — Geotextile — B — Tuck Geotextile a Minimum of 1ft (TYP)

Min. D = Ft.
d = Ft.
B = Ft.

Type of Liner = ? Rip–Rap, Keyed–In

FROM STA. TO STA.

Standard V Ditch (riprap)
- Geotextile under riprap is tucked at the edges
- "Keyed-In" added to direct contractor to make riprap flush with ditch bottom
- "Max. d" changed to "d" to prevent too little riprap from being placed

DETAIL ?
STANDARD 'V' DITCH
(Not to Scale)

Natural Ground — 2:1 — D — 2:1 — Natural Ground

d — Geotextile — Tuck Geotextile a Minimum of 1ft (TYP)

Min. D = Ft.
d = Ft.

Type of Liner = ? Rip–Rap, Keyed–In

FROM STA. TO STA.

Standard Base Ditch (riprap) (B < 6ft)
- Geotextile under riprap is tucked at the edges
- "Keyed-In" added to direct contractor to make riprap flush with ditch bottom
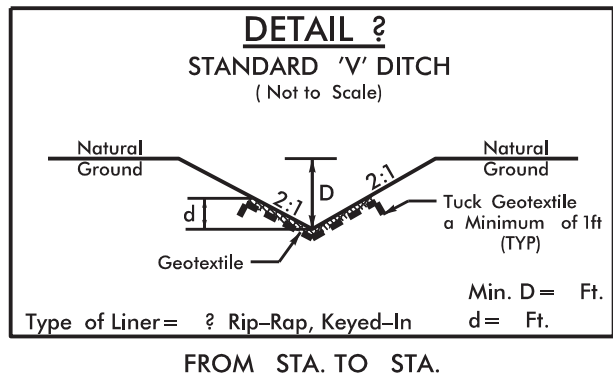- "Max. d" changed to "d" to prevent too little riprap from being placed
- Asterisk "*" has been clarified for when to use the < 6ft detail versus the >6ft detail

DETAIL ?
STANDARD BASE DITCH
(Not to Scale)

Natural Ground — 2:1 — D — 2:1 — Natural Ground

d — Geotextile — B — Tuck Geotextile a Minimum of 1ft (TYP)

Detail Applies When B is < 6.0'
for Class I and II Rip–Rap;
And All Widths for Class B Rip–Rap

Type of Liner = ? Rip–Rap, Keyed–In

Min. D = Ft.
d = Ft.
B = Ft.

FROM STA. TO STA.

DETAIL ?
CHANNEL CHANGE
(Not to Scale)

2ft (TYP)

b

Natural Ground

Proposed Fill Slope

Natural Ground

2:1 D 2:1

1"/Ft.

Place Geotextile Under Riprap in Locations Directed by Engineer

Exist. Channel

B

Min. D = ___ Ft.
B = ___ Ft.
b = ___ Ft.

Tuck Geotextile a Minimum of 1ft (TYP)

Type of Liner = ?, Keyed−In

FROM STA. TO STA.

DETAIL ?
CHANNEL CHANGE
(Not to Scale)

b

Natural Ground

Proposed Fill Slope

Natural Ground

d

2:1 D 2:1

1"/Ft.

Geotextile

Place Geotextile Under Riprap in Locations Directed by Engineer

Exist. Channel

B

Min. D = ___ Ft.
d = ___ Ft.
B = ___ Ft.
b = ___ Ft.

Tuck Geotextile a Minimum of 1ft (TYP)

Type of Liner = ?, Keyed−In

FROM STA. TO STA.

Channel Change

o Original detail has been split into two details. The difference between the two new details is the extent of riprap placement beyond the top of bank. Discuss which of the new details to use with the Division Environmental Officer and / or NEU staff.

- The detail with riprap beyond the top of bank does not contain a "d" for riprap height.
- The detail with riprap within the top of bank contains a "d" for riprap height. "Max d" was changed to "d" to prevent too little riprap from being placed.

o For both new details:
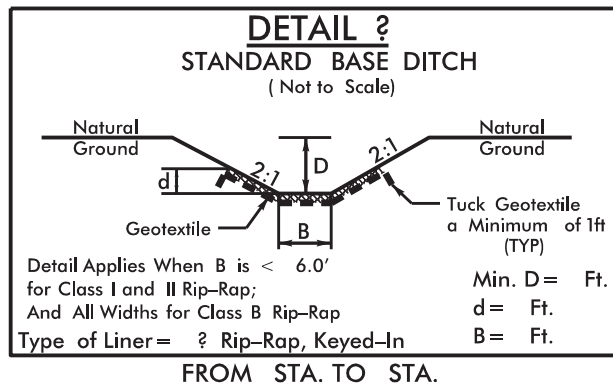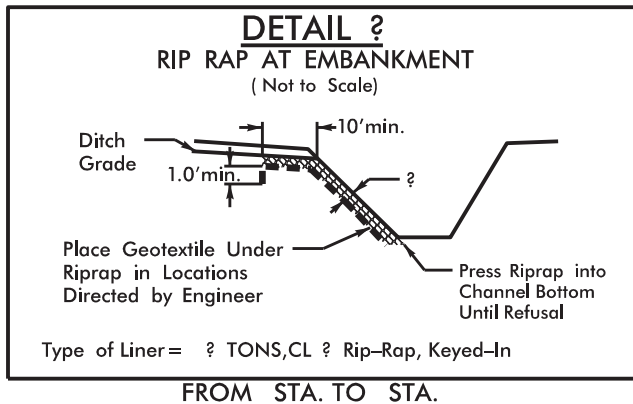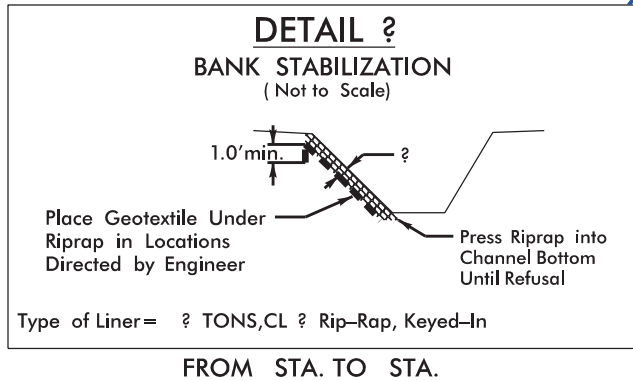
- Geotextile under riprap is tucked at the edges
- "Keyed-In" added to direct contractor to make riprap flush with ditch bottom
- "Place geotextile under riprap in locations directed by engineer" added
- There is not a uniform approach on whether to place geotextile only on the slopes, in the bottom of the channel, or not at all. This note allows the geotextile placement to be determined in the field.
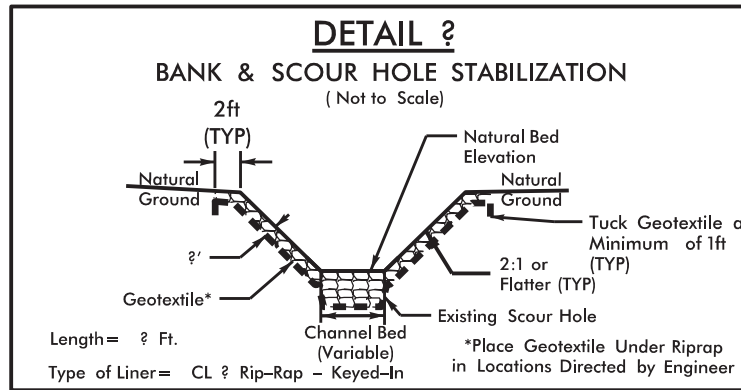
DETAIL ?
BANK STABILIZATION
(Not to Scale)

1.0'min.   ?

Place Geotextile Under
Riprap in Locations
Directed by Engineer

Press Riprap into
Channel Bottom
Until Refusal

Type of Liner =   ? TONS,CL ? Rip–Rap, Keyed–In

FROM STA. TO STA.

DETAIL ?
RIP RAP AT EMBANKMENT
(Not to Scale)

Ditch
Grade   1.0'min.   10'min.

?

Place Geotextile Under
Riprap in Locations
Directed by Engineer

Press Riprap into
Channel Bottom
Until Refusal

Type of Liner =   ? TONS,CL ? Rip–Rap, Keyed–In
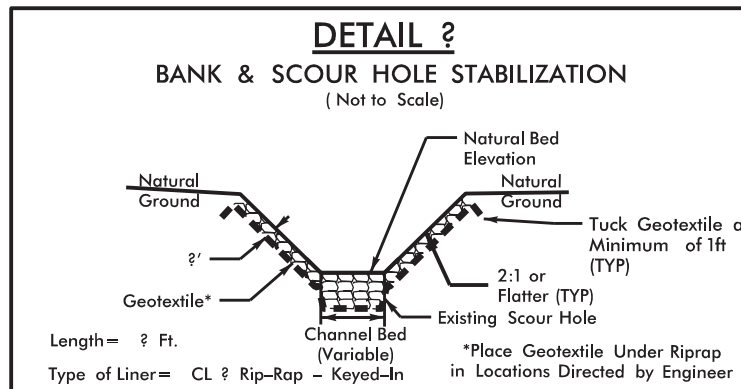
FROM STA. TO STA.

Rip Rap at Embankment
- o Original Detail has been split into two details:
  - Bank Stabilization detail
  - Ditch at top of bank has been eliminated
  - Rip Rap at Embankment detail
  - Ditch length at top of bank has been extended to improve relative scale of ditch to overall detail
- o Changes to both new details:
  - "Place geotextile under riprap in locations directed by engineer" added.
  - There is not a uniform approach on where to place geotextile. This note allows the geotextile placement to be determined in the field.
  - "Geotextile = ?SY" deleted. Since geotextile quantity is indeterminate, this note was removed. An estimated amount of geotextile will need to be included in the bid line items. This is similar to the Channel Change detail.
  - "Press riprap into channel bottom until refusal" note added. This action prevents most stream bottom disturbance, while still allowing the toe of riprap to gain purchase to prevent slumping of the riprap slope.
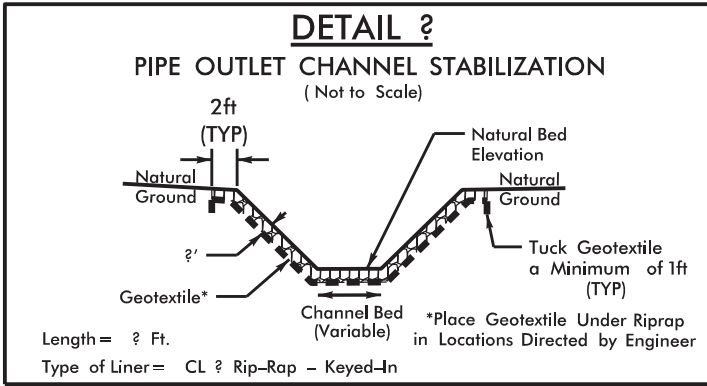 - "Keyed-In" added to direct contractor to make riprap flush with bank.

Summary of Changes

DETAIL ?
BANK & SCOUR HOLE STABILIZATION
(Not to Scale)

2ft
(TYP)

Natural Bed
Elevation

Natural
Ground

Natural
Ground

Tuck Geotextile a
Minimum of 1ft
(TYP)

?'

2:1 or
Flatter (TYP)

Geotextile*

Existing Scour Hole

Length = ? Ft.

Channel Bed
(Variable)

*Place Geotextile Under Riprap
in Locations Directed by Engineer

Type of Liner =   CL ? Rip–Rap – Keyed–In

STA.

DETAIL ?
BANK & SCOUR HOLE STABILIZATION
(Not to Scale)

Natural Bed
Elevation

Natural
Ground

Natural
Ground

Tuck Geotextile a
Minimum of 1ft
(TYP)

?'

2:1 or
Flatter (TYP)

Geotextile*

Existing Scour Hole

Length = ? Ft.

Channel Bed
(Variable)

*Place Geotextile Under Riprap
in Locations Directed by Engineer

Type of Liner =   CL ? Rip–Rap – Keyed–In

STA.

Bank & Scour Hole Stabilization
- o Original detail has been split into two details. The difference between the two new details is the extent of riprap placement beyond the top of bank. Discuss which of the new details to use with the Division Environmental Officer and / or NEU staff.
- o Changes to both new details:
  - ▪ "Place geotextile under riprap in locations directed by engineer" added There is not a uniform approach on where to place geotextile. This note allows the geotextile placement to be determined in the field.
  - ▪ Geotextile under riprap is tucked at the edges.

DETAIL ?
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)

2ft (TYP)

Natural Ground

Natural Bed Elevation

Natural Ground

?'

Geotextile*

Tuck Geotextile a Minimum of 1ft (TYP)

Channel Bed (Variable)

*Place Geotextile Under Riprap in Locations Directed by Engineer

Length = ? Ft.
Type of Liner = CL ? Rip–Rap – Keyed–In

STA.

DETAIL ?
PIPE OUTLET CHANNEL STABILIZATION
(Not to Scale)

Natural Ground

Natural Bed Elevation

Natural Ground

?'

Geotextile*

Tuck Geotextile a Minimum of 1ft (TYP)

Channel Bed (Variable)

*Place Geotextile Under Riprap in Locations Directed by Engineer

Length = ? Ft.
Type of Liner = CL ? Rip–Rap – Keyed–In

STA.

DETAIL ?
PIPE OUTLET BANK STABILIZATION
(Not to Scale)

Natural Ground

EXISTING BANK

EXISTING BANK

Natural Ground

d*

Tuck Geotextile a Minimum of 1ft (Typ)
Place Geotextile Under Riprap in Locations Directed by Engineer

Press Riprap into Channel Bottom Until Refusal (Typ)

CHANNEL BED (Variable)

Length = Ft.
d = Ft.
Est. = ? Tons of Class ? Rip–Rap, Keyed–In

*Rip–Rap to be Installed to 2ft Outside Top of Ditch Slopes on Jurisdictional Streams

FROM STA. TO STA.

DETAIL ?
PIPE OUTLET BANK STABILIZATION
(Not to Scale)

Natural Ground

EXISTING BANK

EXISTING BANK

Natural Ground

Tuck Geotextile* a Minimum of 1ft (TYP)

d

Press Riprap into Channel Bottom Until Refusal (Typ)

CHANNEL BED (Variable)

*Place Geotextile Under Riprap in Locations Directed by Engineer

Length = Ft.
d = Ft.
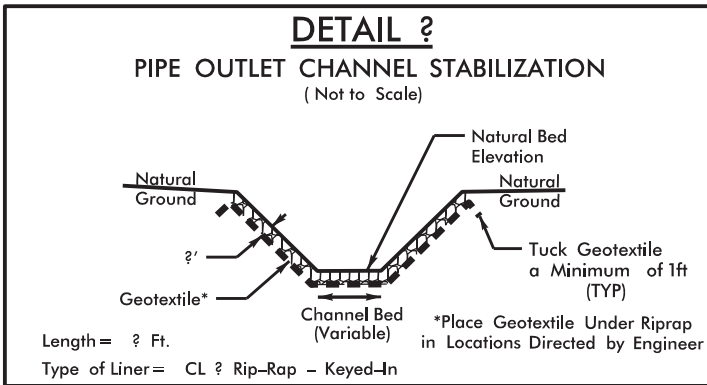Est. = ? Tons of Class ? Rip–Rap, Keyed–In
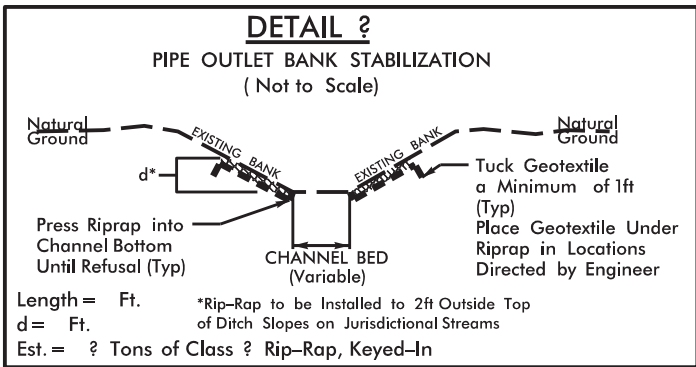
FROM STA. TO STA.

Pipe Outlet Channel Stabilization

o Original detail has been split into two details. The difference between the two new details is the extent of riprap placement beyond the top of bank. Discuss which of the new details to use with the Division Environmental Officer and / or NEU staff.

o Changes to both new details:

  ▪ "Place geotextile under riprap in locations directed by engineer" added There is not a uniform approach on where to place geotextile. This note allows the geotextile placement to be determined in the field.

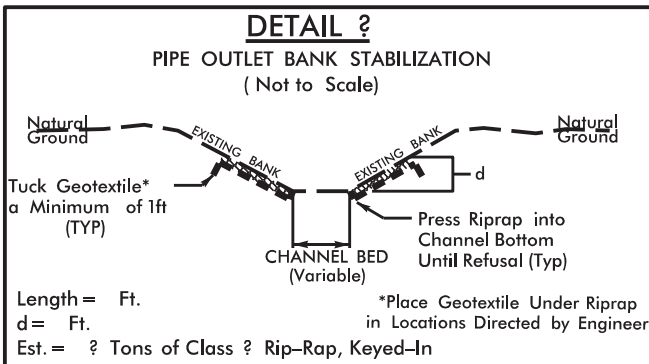 ▪ Geotextile under riprap is tucked at the edges.

Pipe Outlet Bank Stabilization

o Original detail has been split into two details. The difference between the two new details is the extent of riprap placement beyond the top of bank. Discuss which of the new details to use with the Division Environmental Officer and / or NEU staff.

o Changes to both new details:

  ▪ "Place geotextile under riprap in locations directed by engineer" added. There is not a uniform approach on where to place geotextile. This note allows the geotextile placement to be determined in the field.

  ▪ Geotextile under riprap is tucked at the edges.

  ▪ "Press riprap into channel bottom until refusal" note added. This action prevents most stream bottom disturbance, while still allowing the toe of riprap to gain purchase to prevent slumping of the riprap **slope.**