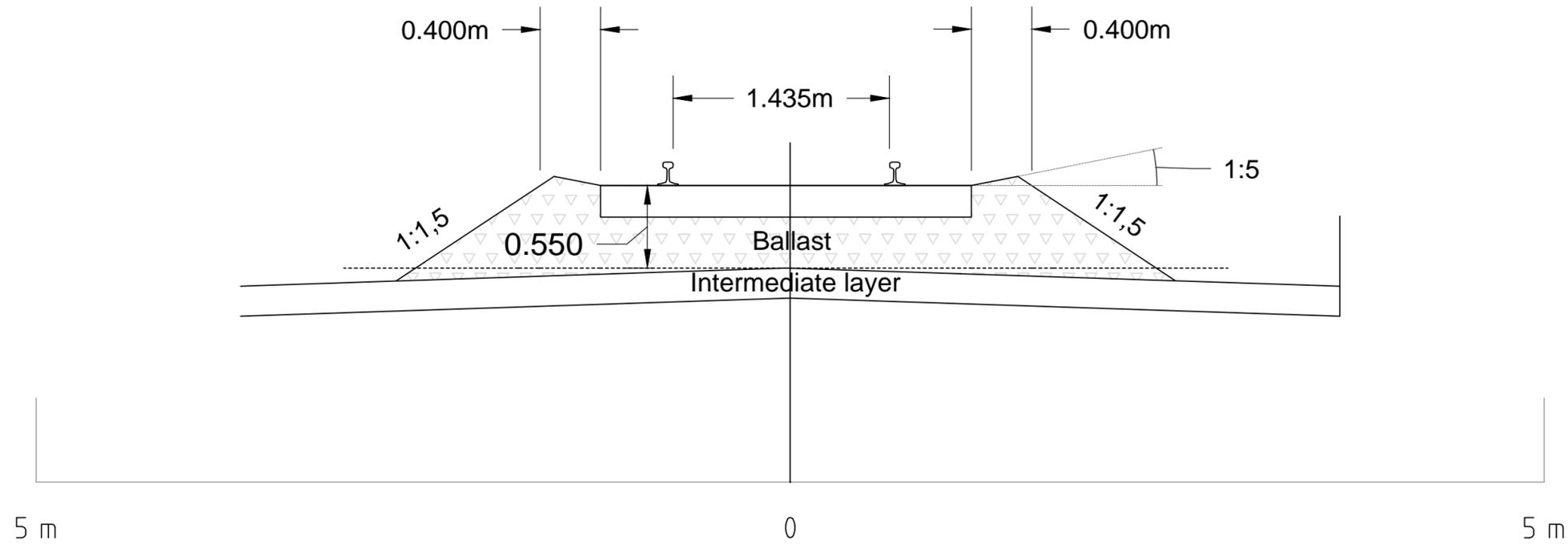
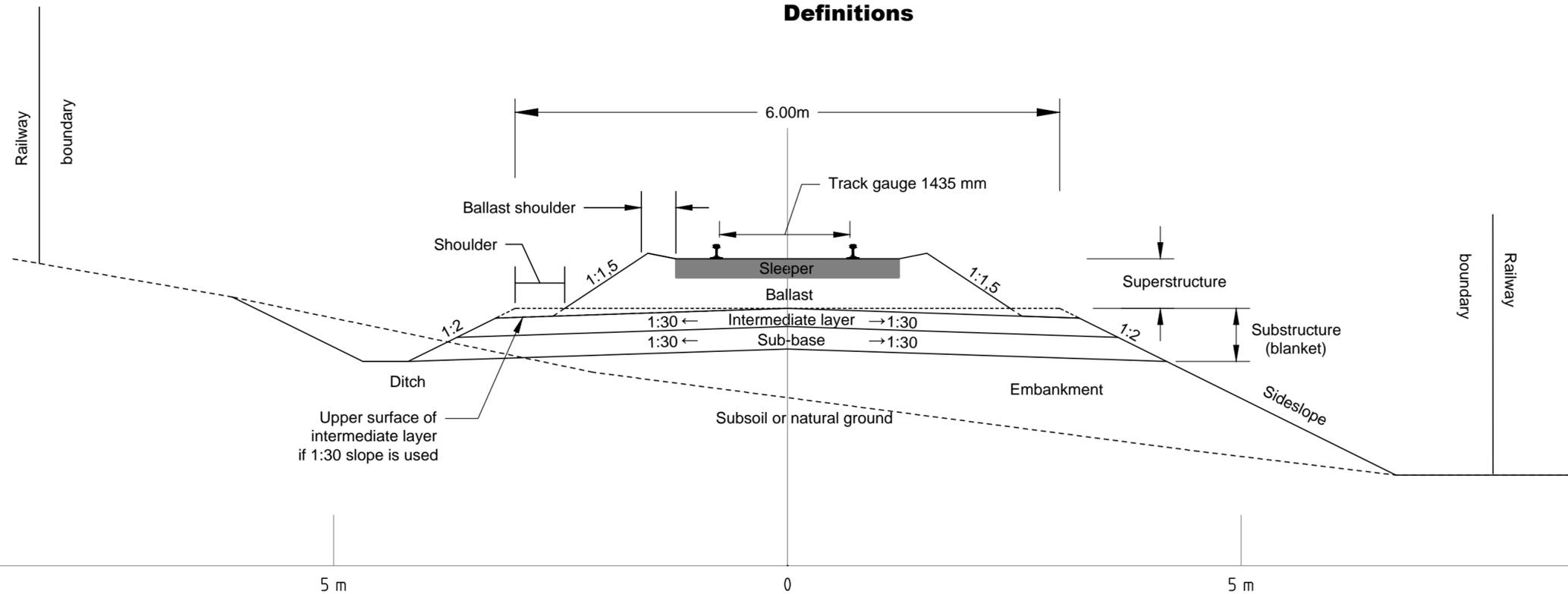


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Definitions

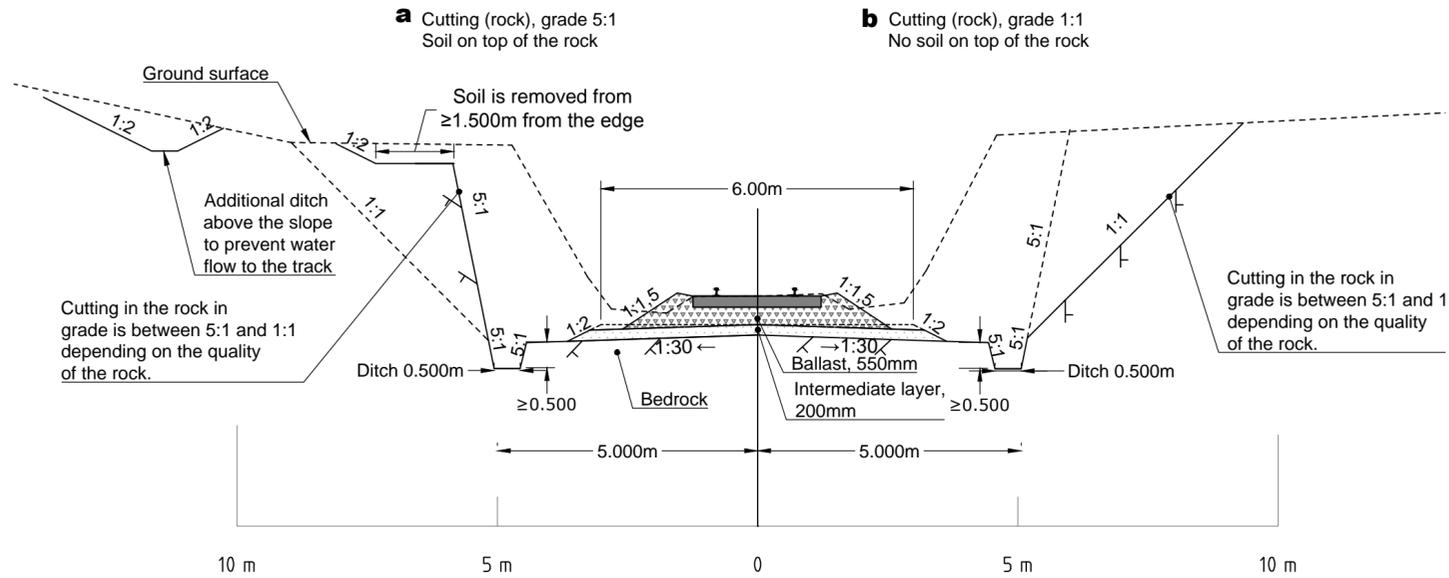


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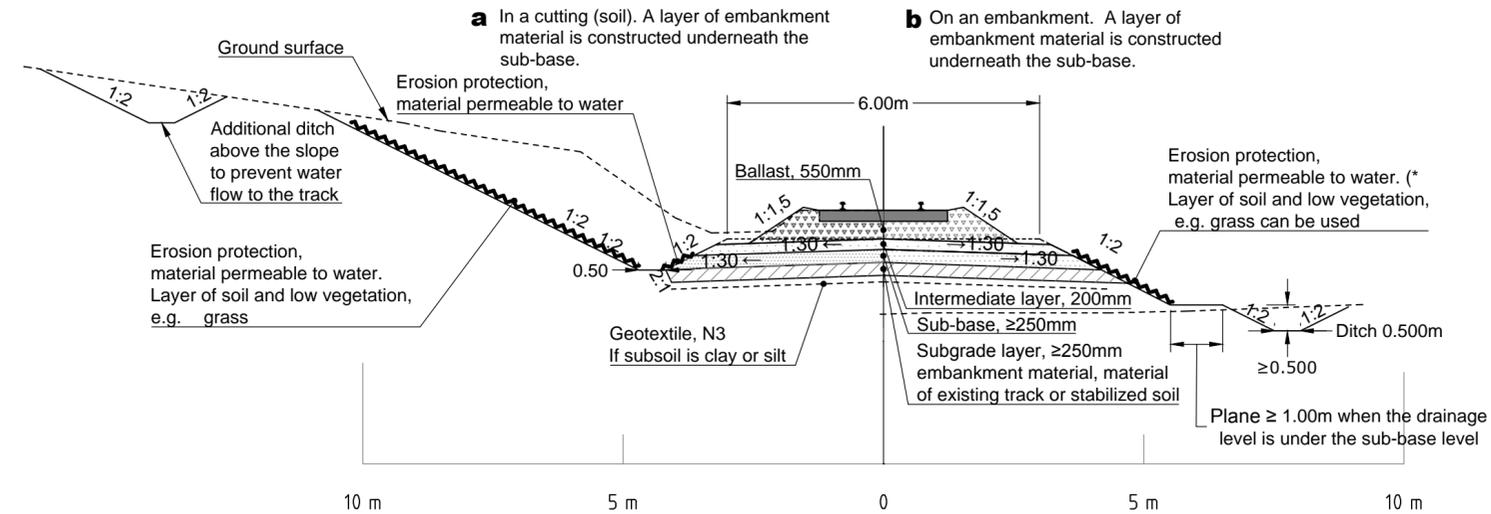
Revision	Explanation	Date	Designer	Date	Acceptor
Customer		Project			
 MINISTERIO DE TRANSPORTE Y OBRAS PÚBLICAS		Railway Project			
		Design phase Pre-engineering, Phase 2			
Supplier		Content			
		Definitions			
		Cross-section definitions			
Drawer	15.12.2017	Henna Valppu	Scale		
Designer	15.12.2017	Auli Vanhoja	1:50		
Supervisor	15.12.2017	Heikki Akkanen	Coordinate and elevation reference system		
Accept.			WGS 84 UTM 21		
Cust. acc.			Railway line		
Archive		Type	Number	Rev.	Sheet
			H1-100	-	1 6

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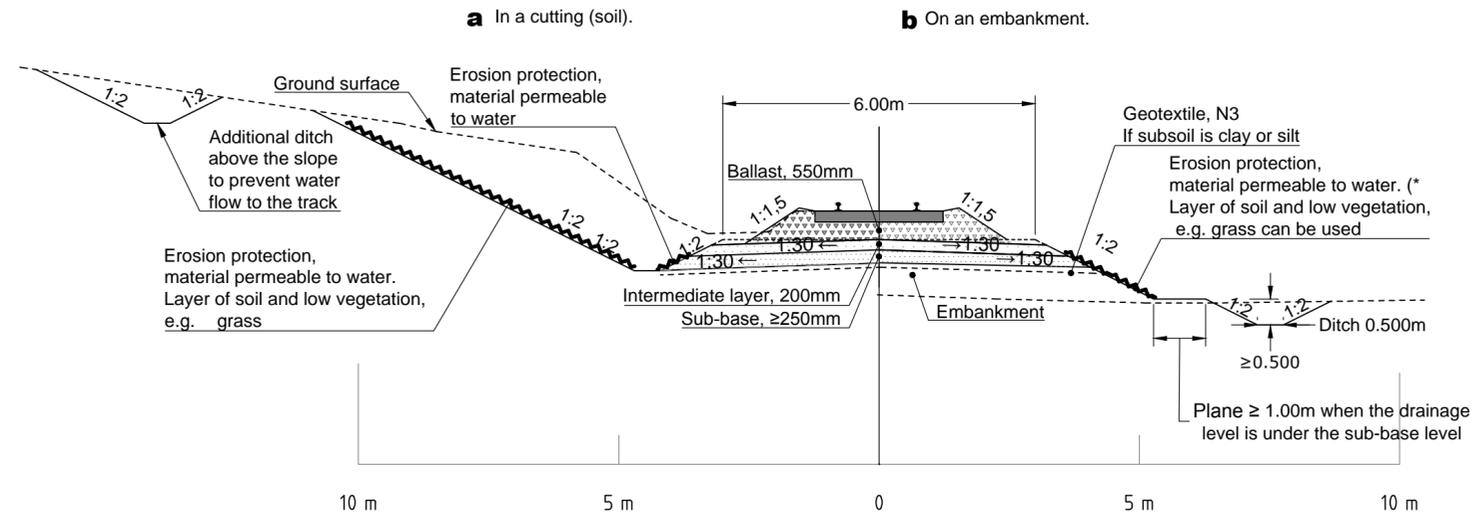
**Typical cross-section:
Category A-1 One track
Structure layers 750mm**



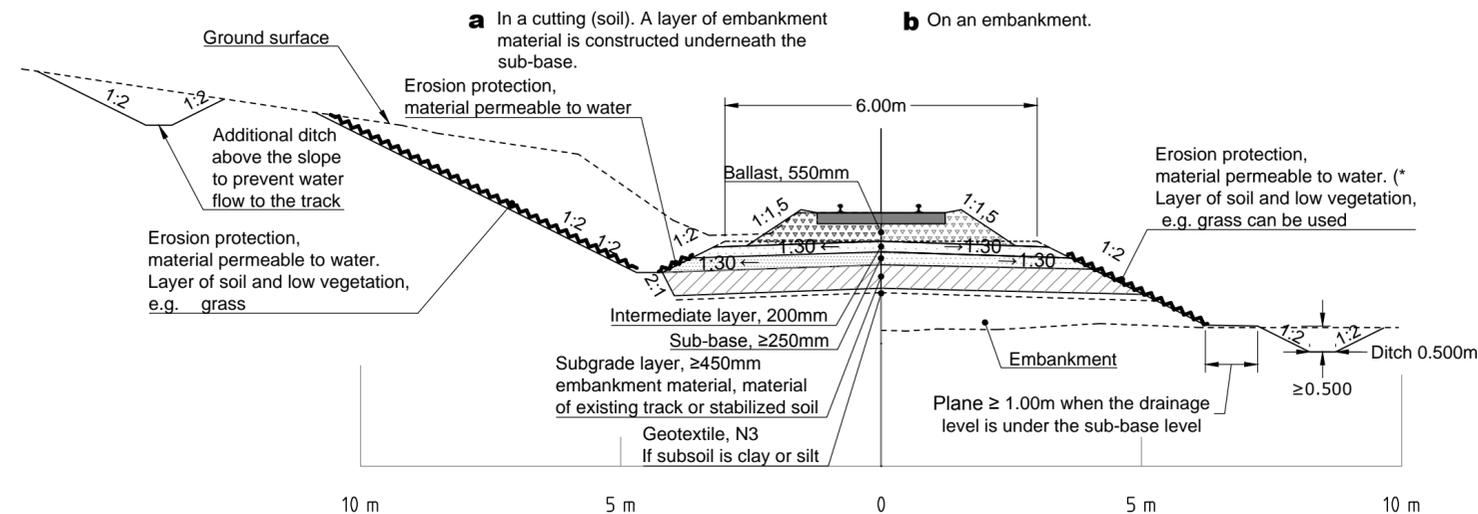
**Typical cross-section:
Category C-1 One track
Structural layers 1250mm**



**Typical cross-section:
Category B-1 One track
Structure layers 1000mm**



**Typical cross-section:
Category D-1 One track
Structural layers 1450mm**



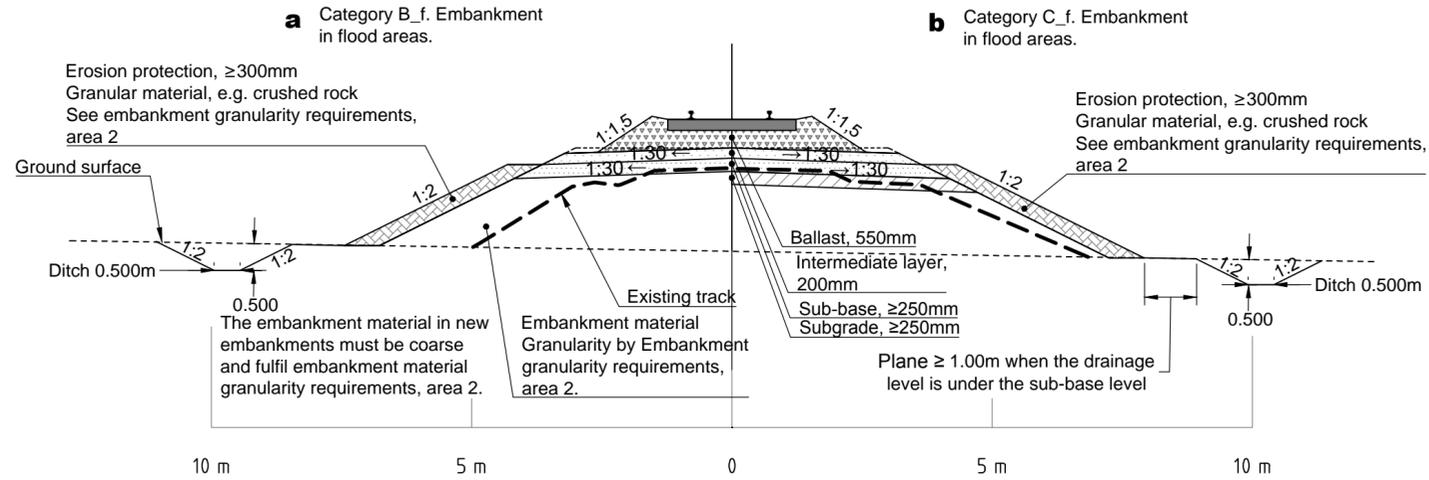
All organic material must be removed from the top of existing structures and below the new embankment.
Backfill with embankment material.

(* Water flow from structural layers and embankment must be ensured for example by constructing sections to erosion protection from coarse grained material. Water in structural layers will decrease bearing capacity.

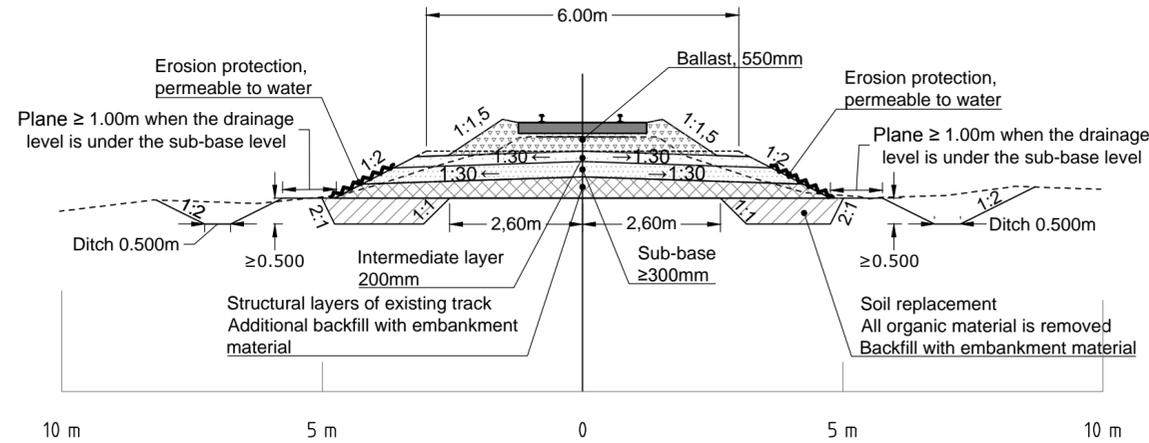
Version 15.12.2017

Revision	Explanation	Date	Designer	Date	Acceptor
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		Design phase Pre-engineering, Phase 2			
Supplier		Content			
		Typical cross-sections - One track Categories A-D			
		Scale 1:100			
Drawer	15.12.2017	Henna Valppu	Coordinate and elevation reference system WGS 84 UTM 21		
Designer	15.12.2017	Auli Vanhoja	Railway line		
Supervisor	15.12.2017	Heikki Akkanen	Archive Type Number Rev. Sheet		
Accept.			H1-100 - 2 6		
Cust. acc.					

**Typical model cross-section:
Flood areas, One track
Category B_f and C_f**



**Soil replacement
Line on existing track
New structural layers
1000mm**

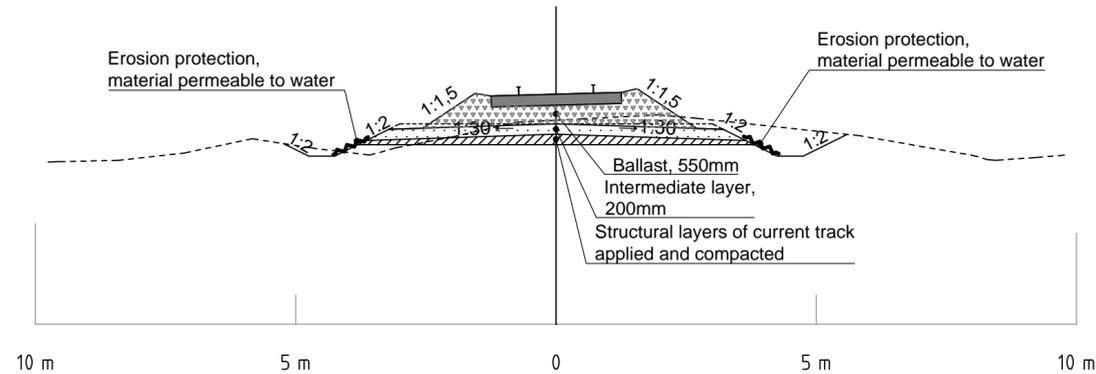


All organic material must be removed from the top of existing structures and below the new embankment.
Backfill with embankment material.

(* Water flow from structural layers and embankment must be ensured for example by constructing sections to erosion protection from coarse grained material. Water in structural layers will decrease bearing capacity.

**Typical cross-section:
Existing track layers applied
Category A_ET One track
Structural layers 750mm**

- Requirements for A_ET**
- Subsoil CBR > 18% (e.g. rock, cobbles)
 - Subgrade CBR > 18% and after compaction E2 at least 80 MPa

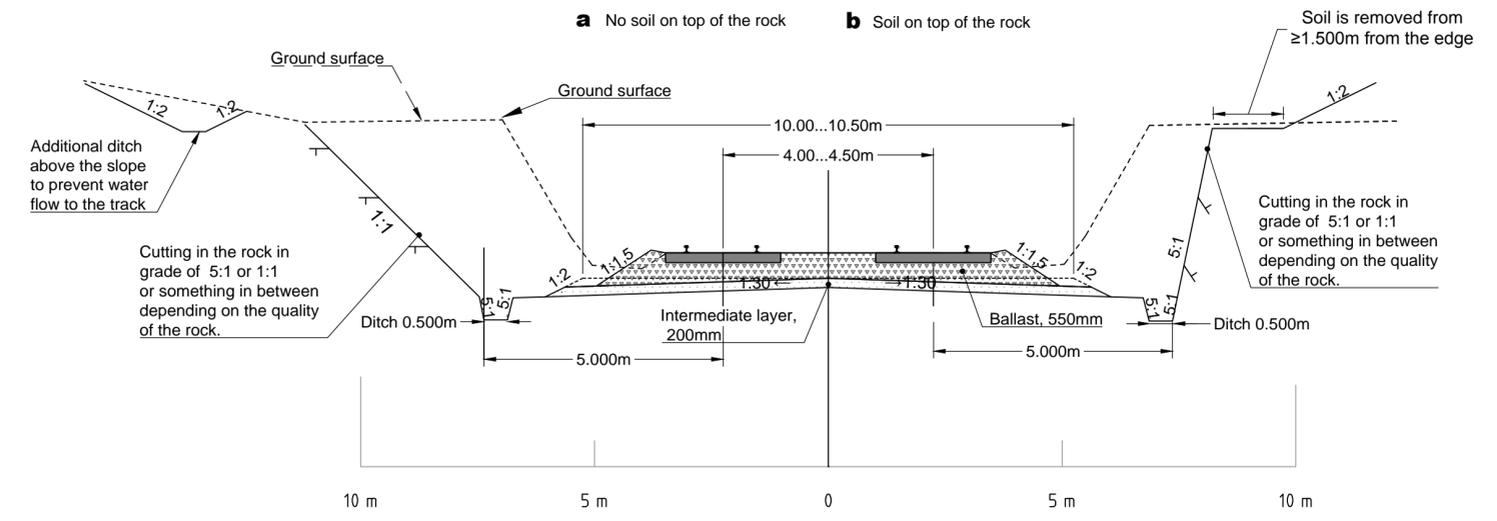


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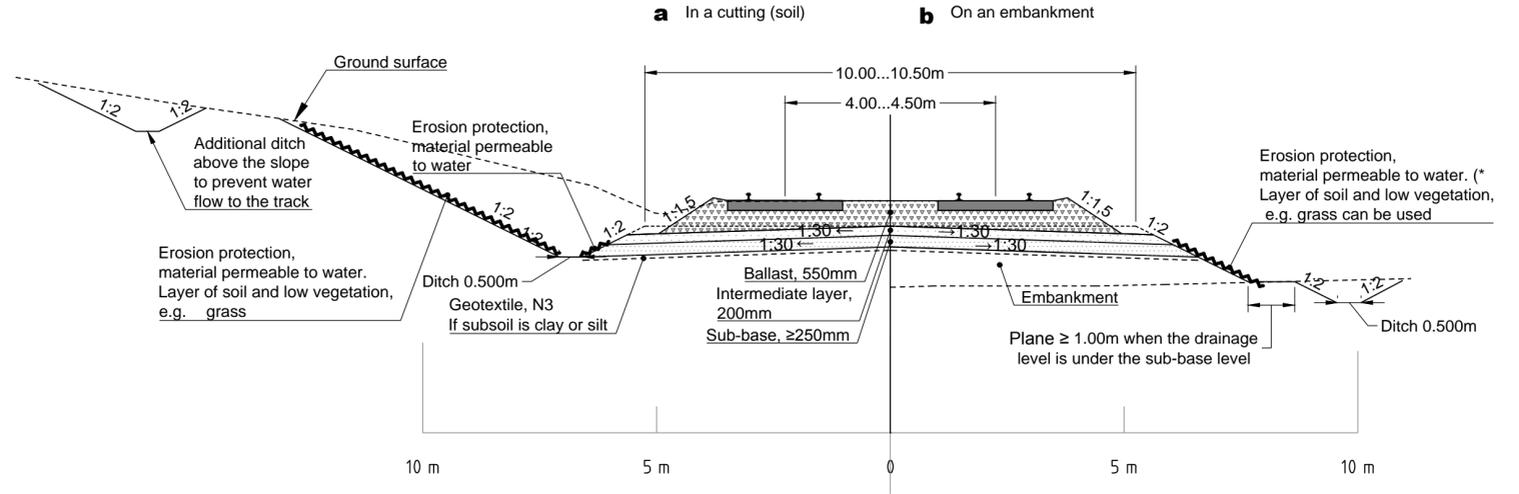
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Customer		Project			
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		Design phase Pre-engineering, Phase 2			
Supplier		Content			
		Typical cross-sections - One track Categories A_ET, B_f, C_f and Line on existing track			
		Scale		1:100	
Drawer	15.12.2017	Henna Valppu	Coordinate and elevation reference system WGS 84 UTM 21		
Designer	15.12.2017	Auli Vanhoja	Railway line		
Supervisor	15.12.2017	Heikki Akkanen	Archive Type Number Rev. Sheet		
Accept.			H1-100 - 3 6		
Cust. acc.					

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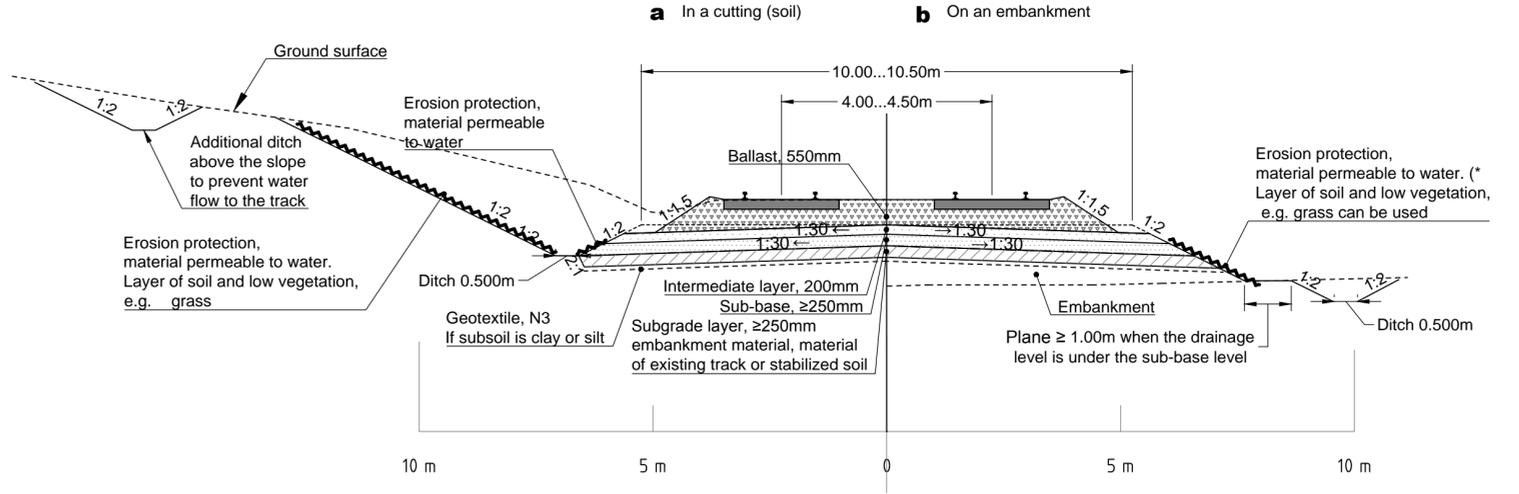
**Typical cross-section:
Category A Double track
Structure layers 750mm**



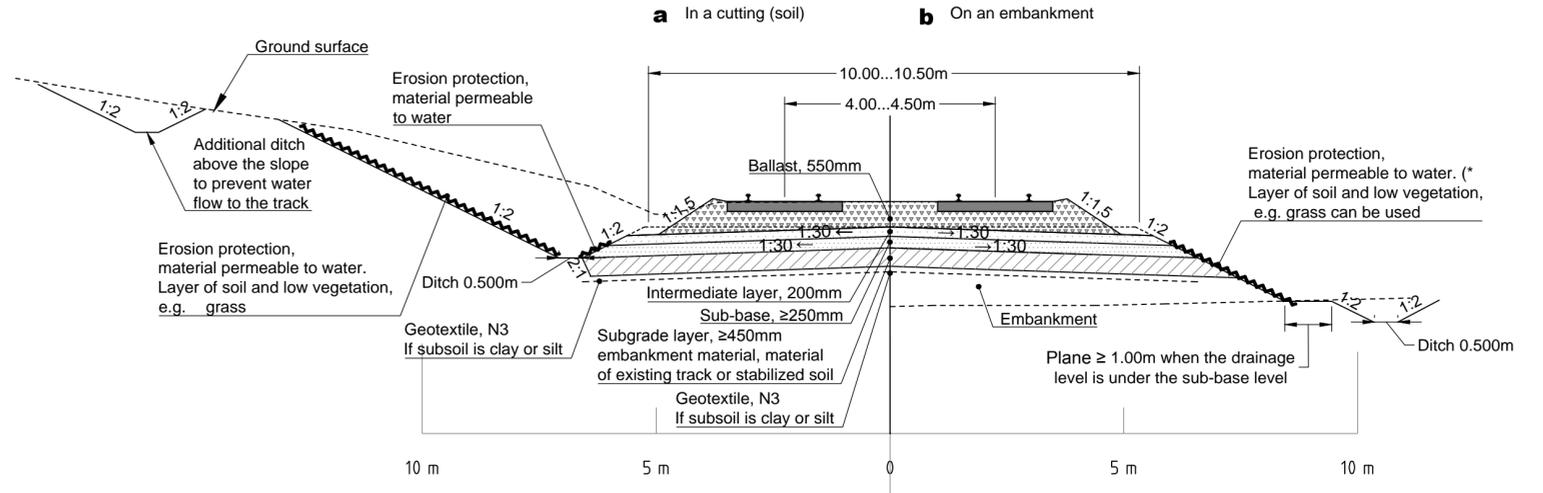
**Typical cross-section:
Category B Double track
Structural layers 1000mm**



**Typical cross-section:
Category C Double track
Structural layers 1250mm**



**Typical cross-section:
Category D Double track
Structural layers 1450mm**



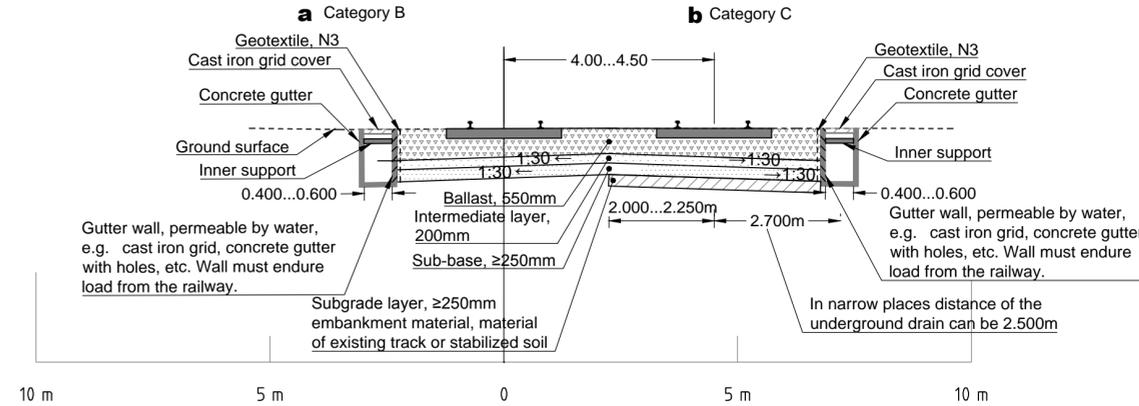
All organic material must be removed from the top of existing structures and below the new embankment.
Backfill with embankment material.

(* Water flow from structural layers and embankment must be ensured for example by constructing sections to erosion protection from coarse grained material. Water in structural layers will decrease bearing capacity.)

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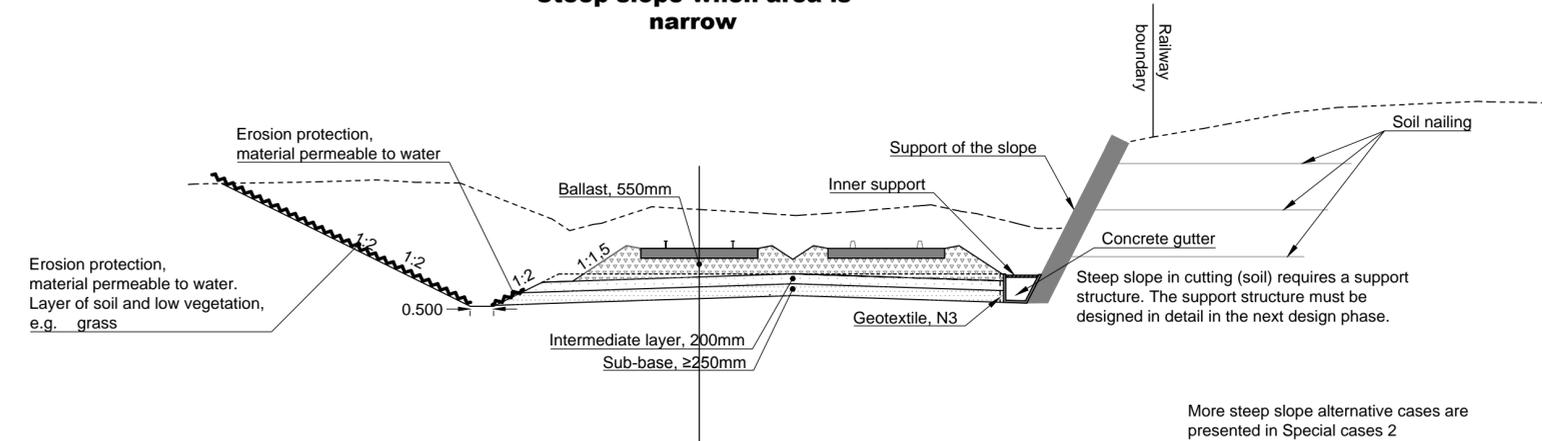
Revision	Explanation	Date	Designer	Date	Acceptor
Customer	 MINISTERIO DE TRANSPORTE Y OBRAS PÚBLICAS	Project			
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Supplier		Design phase			
		Pre-engineering, Phase 2			
Drawer	Content				
Designer	Typical cross-sections - Double track Categories A-D				
Supervisor	Scale				
Accept.	1:100				
Cust. acc.	Coordinate and elevation reference system				
	WGS 84 UTM 21				
	Railway line				
	Archive	Type	Number	Rev.	Sheet
			H1-100	4	6

**Typical cross-section:
Canal and box shaped structure where
railway area is narrow
Structural layers 1000mm or ≥ 1250mm**

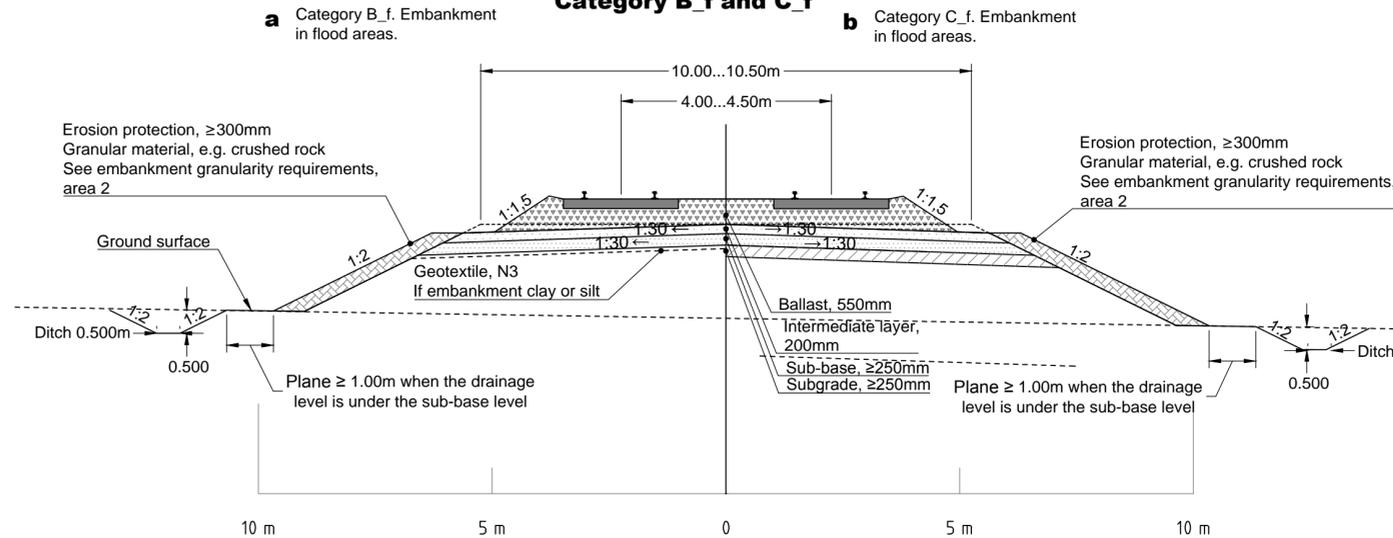


Category B with 200mm intermediate layer and 250mm sub-base is shown in the picture.
Category C includes also ≥250mm of sub-base.

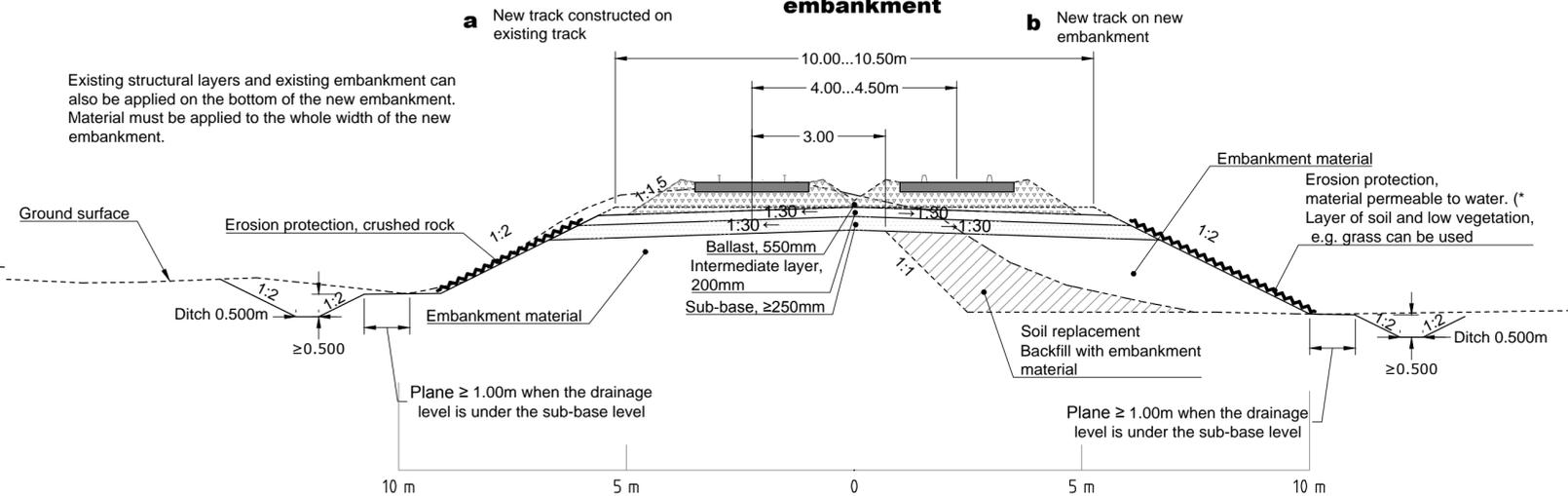
**Typical cross-section:
Tilted retaining wall
Steep slope when area is narrow**



**Typical model cross-section:
Flood areas
Category B_f and C_f**



**Typical cross-section:
Second track on new embankment**



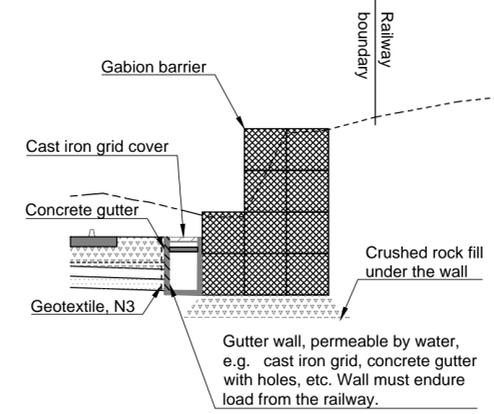
All organic material must be removed from the top of existing structures and below the new embankment. Backfill with embankment material.

(* Water flow from structural layers and embankment must be ensured for example by constructing sections to erosion protection from coarse grained material. Water in structural layers will decrease bearing capacity.

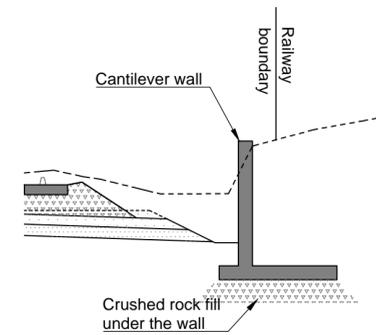
Version 15.12.2017

Revision	Explanation	Date	Designer	Date	Acceptor
Customer					
 MINISTERIO DE TRANSPORTE Y OBRAS PÚBLICAS			Project Railway Project		
Supplier			Design phase Pre-engineering, Phase 2		
			Content Typical cross-sections - Double track Special cases 1		
Drawer	15.12.2017	Henna Valppu	Scale		1:100
Designer	15.12.2017	Auli Vanhoja	Coordinate and elevation reference system		WGS 84 UTM 21
Supervisor	15.12.2017	Heikki Akkanen	Railway line		
Accept.			Archive	Type	Number
Cust. acc.					Rev. Sheet
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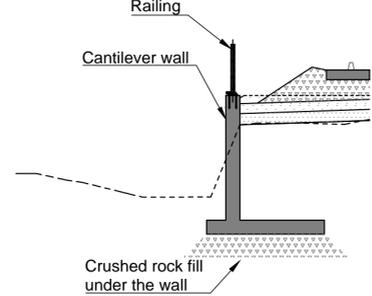
**Alternative solution for steep slope:
gabion barrier**



**Alternative solution for steep slope:
cantilever wall**



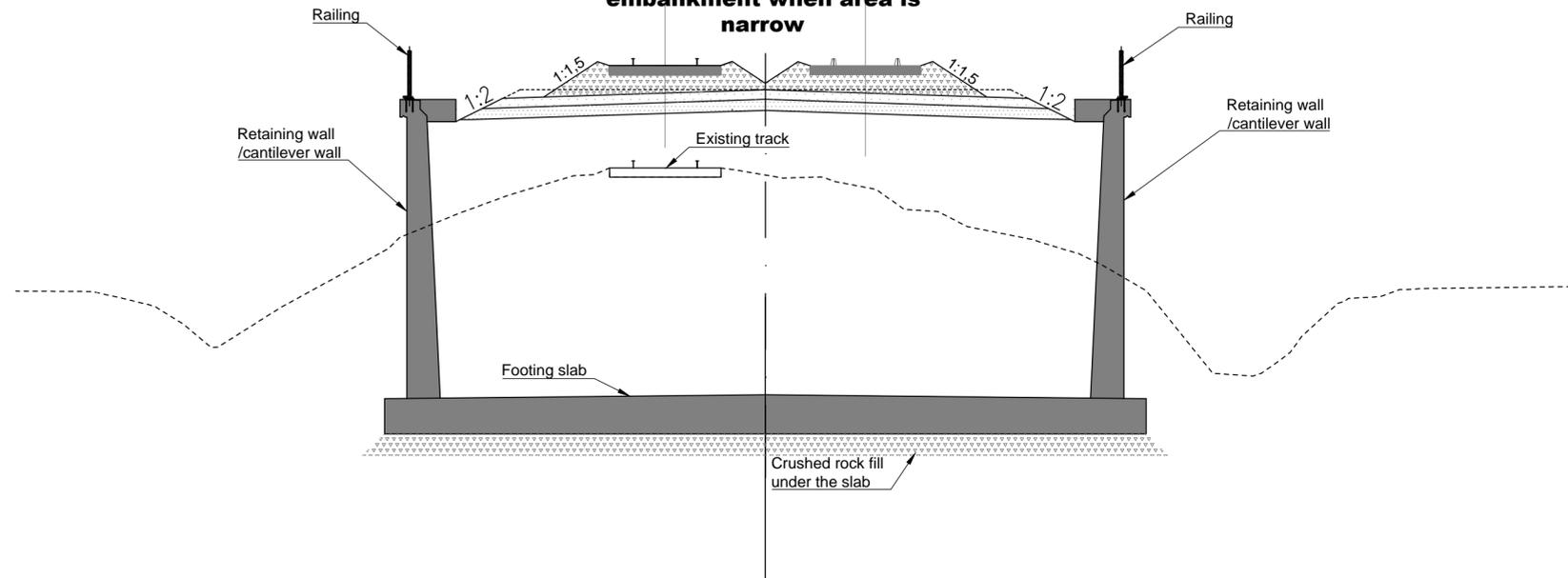
Alternative solution when area for embankment is narrow



All structures are just examples. Retaining walls and the steep slope support structures will be defined and other solutions can be considered in the detail design phase.

Typical cross-section: Retaining wall with footing in embankment when area is narrow

Typical cross-section can be applied in areas where there is no space for normal embankment.



All organic material must be removed from the top of existing structures and below the new embankment. Backfill with embankment material.

(* Water flow from structural layers and embankment must be ensured for example by constructing sections to erosion protection from coarse grained material. Water in structural layers will decrease bearing capacity.

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Revision	Explanation	Date	Designer	Date	Acceptor
Customer		Project			
 MINISTERIO DE TRANSPORTE Y OBRAS PÚBLICAS		Railway Project			
		Design phase Pre-engineering, Phase 2			
Supplier		Content			
		Typical cross-sections - Double track			
		Special cases 2			
Drawer	15.12.2017	Petri Uuttu	Scale		1:100
Designer	15.12.2017	Auli Vanhoja	Coordinate and elevation reference system		WGS 84 UTM 21
Supervisor	15.12.2017	Heikki Akkanen	Railway line		
Accept.			Archive	Type	Number
Cust. acc.					Rev. Sheet
					H1-100 - 6 6