A: Formalities

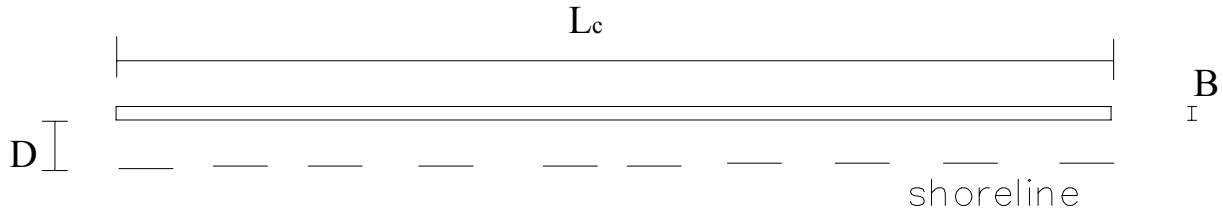
Participant code and who to contact.	UR3-MOD
E-mail	leof@uniroma3.it
This date (today, mm:dd:yyyy) and revision number (A..Z).	10-31-2001 C
Location of LCS.	Ostia (Roma)
Start date, length and/or end of works. Have there been any later changes? If so, when?	Start May ’89 End June ‘90
Design life - the minimum length of time the beach management scheme is designed to last.	
Which tools and regulations are used for the design formulae (mathematical models, model tests, engineering experience, standards, recommendations).	Engeneering experience, standards
Who fund the work (e.g. Public Administration or private company)?	
Costs.	

B: Geometry and construction materials

B1 System layout (aerial view)

Are shore attaching structures present (e.g. groins)?	☐Yes ☒No
Are emerging head islands present?	☐Yes ☒No

The following sketch concerns only shore parallel LCS; if the layout is different you must insert another sketch and specify parameters like the ones suggested. If a picture is available please insert it too.



The typical layout is given at Sea Bed (index SB) and at Crest Level (index CL).

Parameter	Description	Fill in box	unit
D	Distance from shoreline	150	meters
L_{SB}	Length of LCS at sea bed	3000	meters
L_{CL}	Length of LCS at crest level	3000	meters
n	Number of LCS in system	1	

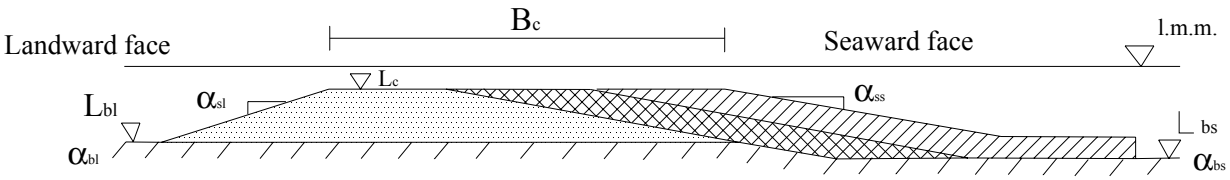
Remarks

B2 Bathymetry of sea bed and beach

Please insert a dimensioned sketch if possible.

Description of bathymetry when LCS were build Is detailed information (measurements) available? If so, please explain.

B3 Trunk cross section/contour geometry – outer profile

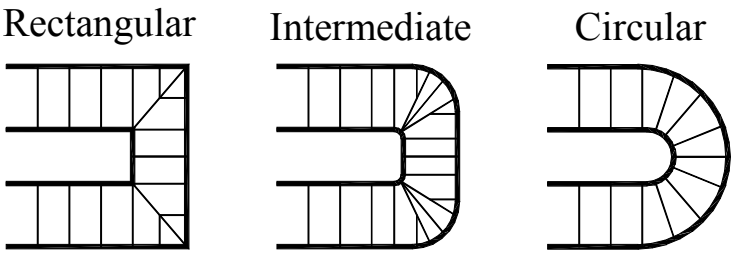


Cross section

Parameter	Description	Fill in box	unit
α_{BS}	Steepness of sea bed, seaward	1:8	
α_{BL}	Steepness of sea bed, landward	1:8	
α_{SS}	Steepness of slope, seaward	1:5	
α_{SL}	Steepness of slope, landward	1:3	
ℓ_C	Level of crest	-1.5	meters
ℓ_{BL}	Level of sea bed, landward	-4(-5)	meters
ℓ_{BS}	Level of sea bed, seaward	-4(-5)	meters
B_{CL}	Width of crest	15	meters

Remarks

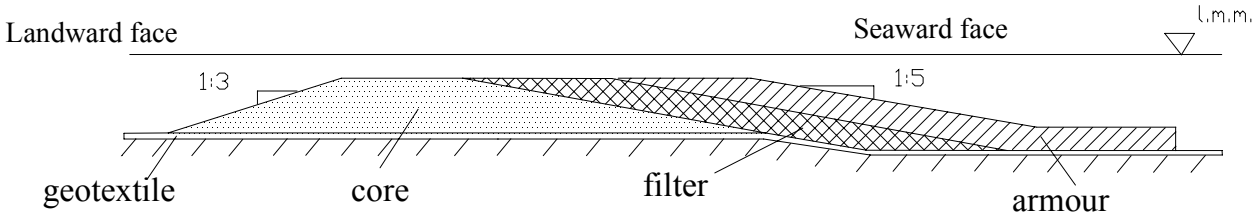
B4 Round head contour geometry



What is the shape of the round head?
☐ Rectangular
☐ Intermediate
☐ Circular

B5 Description of layers

Please insert a dimensioned sketch with the typical cross-section composition.



For each layer, please provide the following information.

Layer type e.g. ARMOUR LAYER CHARACTERISTICS			
Parameter	**Description**	**Fill in box**	**unit**
	Material (e.g. quartzite, concrete)	Limestone, basalt	
	Shape of blocks (e.g. quarry rock, sea stones, cubes)	Quarry rock	
ρ_r	Mass density of material	2500	kg/m^3
D_{n50}	Nominal diameter		meters
Gr	Grading of the material (D_{85}/D_{15})		
	Geotextile between layers?	☒Yes ☐ No	

Remarks (e.g. details on geotextile)

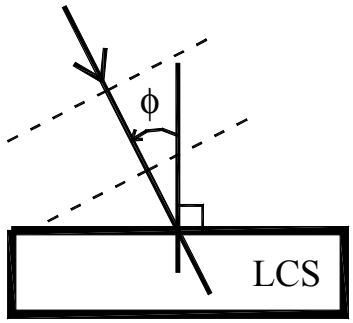
B6 Construction method

How have the stones been placed?
☐ Dumped with barges
☒ Placed with barges
☐ Land based operation
☐ Other:

Sequence of operation.
☒ Construction started upstream
☐ Construction started downstream

C: Local meteomarine conditions at the structure

C1 Waves



Parameter	Description	Fill in box	unit
H_S	Design significant wave height		meters
T_P	Design peak period		seconds
ϕ	Design wave incidence angle		degree

Remarks (provide information on wave statistics and wave spectra if available, e.g. H_S corresponding to return periods 1 month, 1 y, 10 y, 50 y. Please specify the source of the data)

Tr	Hs(Tr)
10	2,26
20	2,57
25	2,67
50	2,99
100	3,30

C2 Water levels

TIDAL WATER LEVEL VARIATIONS			
Parameter	**Description**	**Fill in box**	**unit**
HAT	Highest astronomical tide level	0.35	meters
MHWL	Mean tide high water level		meters
MWL	Mean water level		meters
MLWL	Mean tide low water level		meters
LAT	Lowest astronomical tide level		meters

Water level statistics Not available

C3 Current

Tidal currents

Description & statistics if available
There is not a significative tidal current.

Surge generated currents

Description & statistics if available

D: Sea bed and beach characteristics, incl. sediment transport

Description of the coast Sandy beaches with gentle slope The orginal beach sowed multiple bars.

D1 Natural sea bed material at surface

Parameter	Description of sea bed material	Fill in box	unit
	Material (e.g. quartzite)	Sand	
ρ_r	Mass density of material	1-75	kg/m^3
D_{n50}	Nominal diameter grain size	0.1	meters
Gr	Grading of the material (D_{85}/D_{15})		

Remarks (provide grain distribution if available)

D2 Natural beach material at surface

Parameter	Description of beach material	Fill in box	unit
	Material (e.g. quartzite)	Sand	
ρ_r	Mass density of material		kg/m^3
D_{n50}	Nominal diameter grain size	0.1	meters
Gr	Grading of the material (D_{85}/D_{15})		

Natural supply?	☒ Yes ☐ No
Supplied by beach nourishment?	☒ Yes ☐ No

Remarks (provide grain distribution if available)

D3 Artificial beach nourishment

Description of nourishment

Parameter	Description of artificial nourishment	Fill in box	unit
	Material (e.g. quartzite)	Sand and gravels	
ρ_r	Mass density of material		kg/m^3
D_{n50}	Nominal diameter	0.6	mm
Gr	Grading of the material (D_{85}/D_{15})		

Remarks (provide grain distribution if available)
There are two layers of artificial beach nourishment. Upper one constituted of quarry sand with D_{n50}=0.6 mm . The second one constituted of sand and gravel with D_{n50}=20-60 mm.

D4 Sediment transport

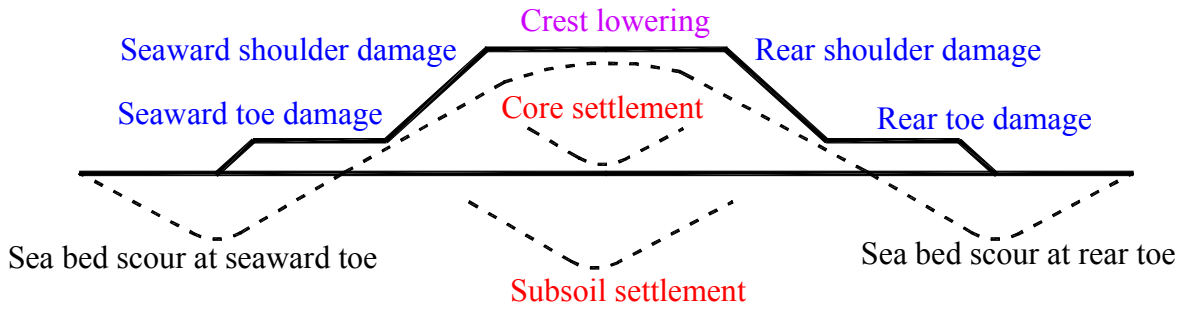
Description of the sediment transport Most of the natural sediment transport was provided by the Tiber river whose mouth is just northward from Ostia. The natural sediment load has been reduced in the last century.

Parameter	Description of sediment	Fill in box	unit
	Material (e.g. quartzite)		
ρ_r	Mass density of material		kg/m^3

D_{n50}	Nominal diameter		meters
Gr	Grading of the material (D_{85}/D_{15})		

E: Structural performance

E1 Definition of failure modes



E2 Materials

Problems caused by deterioration?	☐ Yes ☒ No
Problems caused by breakage?	☐ Yes ☒ No

Description of the condition of the materials

E3 Settlement of the structure

Description of settlements of core/subsoil The whole structure has been reshaped by the incident wave action. The landward part of the structure was the most seriously damaged due to the size of the stones.

E4 Local erosion of sea bed/scour

Description of erosion/scour by roundheads (please specify scour depth) Nothing observed

Description of erosion/scour by trunk (please specify scour depth) Nothing observed

E5 Erosion and instability of slopes, shoulders, crest and toes

Stage of damage
☐ No or marginal damage
☒ Moderate to severe damage
☐ Failure

Description of displacements of structural material (provide sketch if possible)

E6 Damage parameters

The definition of a displaced unit is, when a unit is displaced by more than D_{n50}.
Try to give an estimate of the following damage parameters relevant to armour.

Parameter	Description	Fill in box	unit
The relative number of displaced units	$D(\%) = \frac{n_d\,(\text{number of displaced units})}{\text{Total number of units}} \cdot 100$	0	%
The strip displacement	$N_{od} = \frac{n_d}{L / D_{n50}}$, L is the length of LCS	0	

F: Socio-economic aspects

What regime of property has the coast at this site?
Private ☐, Public full free access ☒, Public limited access ☐, Natural reserve ☐, Don't know ☐,
Other (please specify):

Who decided that an LCS should be built at that site?
Individual, acting for private purpose ☐
Individual, acting for public purpose (e.g. Natural park administrator) ☐
Local authority (e.g. city council) ☒
Regional authority (e.g. province level) ☒
National authority (e.g. ministry) ☐
Don't know ☐
Please give name of the authority whenever applicable:

What was the main motive for building the LCS?
Coast erosion ☒
Inducing or maintaining recreational activity ☒, please specify:
Environmental concern ☐, please specify:
Other ☐, please specify:
Don't know ☐

Was that LCS part of a larger coastal management plan?
Yes ☒, please specify:
No ☐, please specify:
Don't know ☐

Public opinion on that LCS:

Construction was accompanied by public protest ☐
The public did not react ☐
Public opinion asked for the LCS ☐
Local commerce asked for the LCS ☒
Don't know ☐
Other (please specify):

Description of the coast:

Urban ☐, Densely constructed ☒, Scarcely constructed ☐, No apparent construction ☐
Are there dunes? Yes ☐, No ☐
Has commercial activity changed significantly after construction of the LCS?
hotels construction: More hotels ☐, Less hotels ☐, Unaffected ☒, Don't know ☐
bars and similar construction: More ☐, Less ☐, Unaffected ☒, Don't know ☐
advertising for the area: More ☐, Less ☐, Unaffected ☒, Don't know ☐
other (specify):

Visual impact of LCS not already described in Part B: Are there parts of the LCS visible under average conditions? Poles ☐, Cables ☐, Reefs ☐,
Others (please specify):

Water quality changes since LCS construction

Are there episodes of water turbidity since construction?
No ☒, Rare ☐, Often ☐, Permanent ☐
Were there episodes of water turbidity before construction?
No ☒, Rare ☐, Often ☐, Permanent ☐
Has water quality otherwise been affected (for example, more or less detritus accumulating)?
Please describe:

How would you qualify the following recreational activities at or around the LCS? (DK = Don't know)

Fishing (recreational)	Intense ☐	Moderate ☒	Scarce ☐	Absent ☐	DK ☐
Seafood collecting	Intense ☐	Moderate ☒	Scarce ☐	Absent ☐	DK ☐
Wildlife watching	Intense ☐	Moderate ☐	Scarce ☐	Absent ☒	DK ☐
Sunbathing and similar	Intense ☒	Moderate ☐	Scarce ☐	Absent ☐	DK ☐
Scuba diving	Intense ☐	Moderate ☐	Scarce ☐	Absent ☒	DK ☐
Sailing and similar	Intense ☐	Moderate ☒	Scarce ☐	Absent ☐	DK ☐
Other (specify)	Intense ☐	Moderate ☐	Scarce ☐	Absent ☐	DK ☒

Could you describe those recreational activities before the LCS was built? (DK = Don't know)

Fishing (recreational)	Intense ☐	Moderate ☐	Scarce ☒	Absent ☐	DK ☐
Seafood collecting	Intense ☐	Moderate ☐	Scarce ☒	Absent ☐	DK ☐
Wildlife watching	Intense ☐	Moderate ☐	Scarce ☐	Absent ☒	DK ☐
Sunbathing and similar	Intense ☒	Moderate ☐	Scarce ☐	Absent ☐	DK ☐
Scuba diving	Intense ☐	Moderate ☐	Scarce ☐	Absent ☒	DK ☐
Sailing and similar	Intense ☐	Moderate ☒	Scarce ☐	Absent ☐	DK ☐
Other (specify)	Intense ☐	Moderate ☐	Scarce ☐	Absent ☐	DK ☒

Has that LCS had an environmental impact assessment before being built? Yes ☐, No ☐, Don't know ☐
Could you give its references and location (specify)?

Has there been an economic study on that LCS,
before it was built? Yes ☐, No ☐, Don't know ☒, References:
after it was built? Yes ☐, No ☐, Don't know ☒, References:

G: Ecological aspects

What are the dominant species on the structures? The rock barrier has favoured the devolopment of marine fauna, being now fully covered with mussels

What are the dominant species in the sediment and fish assemblages around the structures?

Were any environmental changes observed following the construction of the structure (e.g. increase of water turbidity, floating algal debris)?

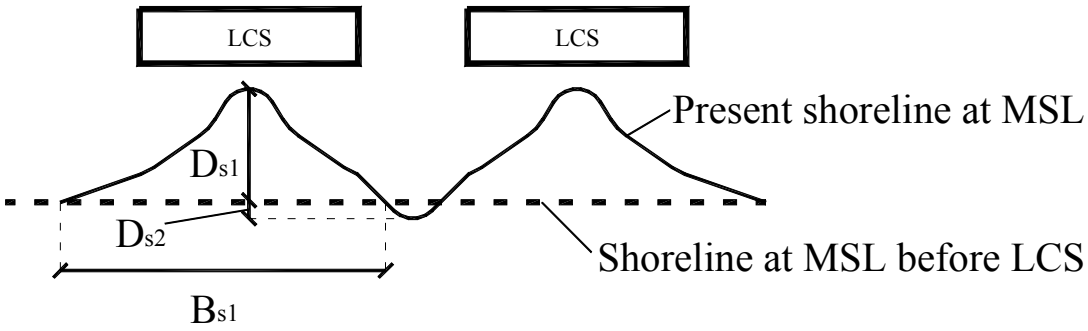
H: Coastal protection performance

H1 Bathymetry and beach evolution

Description of historical beach evolution before LCS was built (10-20 years).
In the last 25 years ,a severe erosion process has been taken place, reverting the evolution trend to a recession rate of 1.7 m/year, due mainly to the strong reduction of river sediment supply

Description of beach evolution after LCS was built up to now.
In the first years after the construction there were a retreat of the beach in the north of the area due to the southward directed longshore trasport and a small accretion in the south of the area, then in the 1996 there was an equilibrium condition.

H2 Salient formation

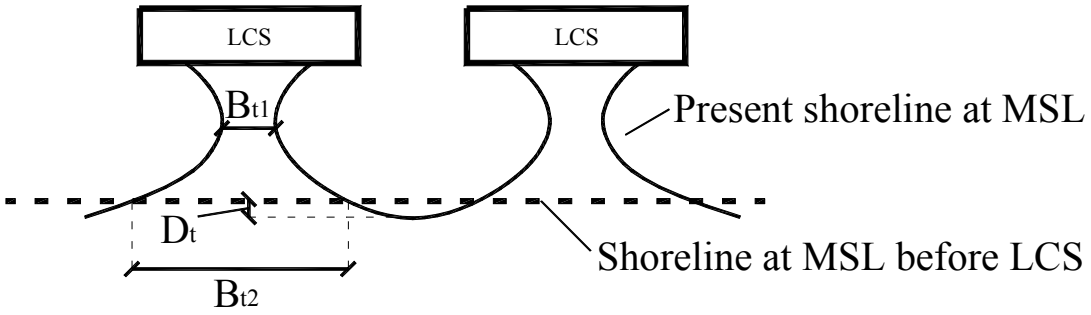


Parameter	Description	Fill in box	unit
D_{s1}	Max distance between new and old shoreline, seaward		meters
D_{s2}	Max distance between new and old shoreline, landward		meters
B_{s1}	Width of salient at old MSL		meters

There are no salient formation.

H3 Tombolo formation

There are no tombolo formation.



Parameter	Description	Fill in box	unit
D_t	Distance between new and old shoreline, landward		meters
B_{t1}	Minimal width of tombolo		meters
B_{t2}	Width of tombolo at old MSL		meters

H4 Renourishment

Description of renourishment (add more fill) (e.g. amount, how often)
Beach renourishmentup to a depth of –4m, with 1360000 m^3 of sand.
From 1998 to 2000 other renourishment have been done with 41000 m^3 of sand, only in some litoral sections.

H5 Down drift erosion

Please insert a sketch if relevant.

Description of down drift erosion (morphological impact, e.g. down drift erosion length and maximal down drift shoreline retreat)

I: Problems in general

Description of other problems/impacts