TDP2 Plan

Atsushi Enomoto
(KEK)

BCD - RDR
(2005 ~ 2007)

Geotechnical review for the potential sites

Chose a proper sample site for BCD/RDR

Applied the ILC layout to the site

Tunnel/cavern design

Construction methods and schedule study

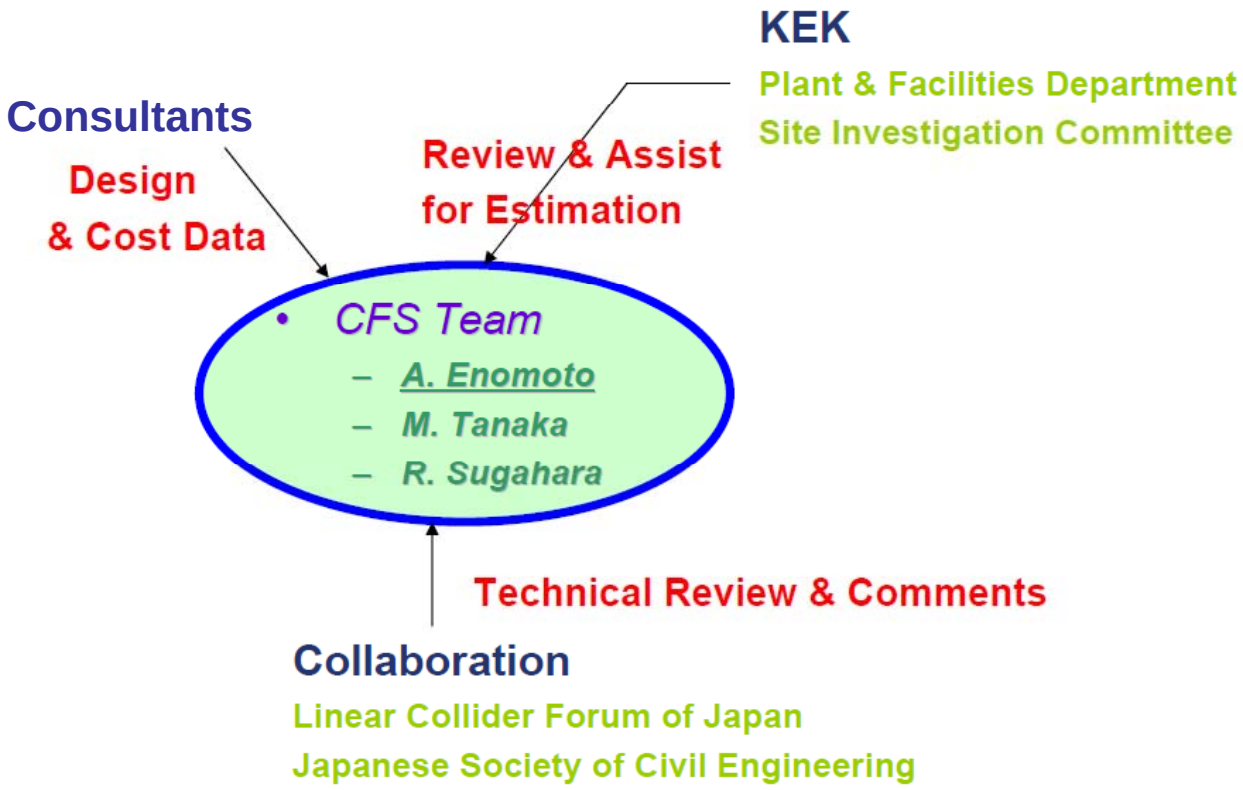
Establish unit costs for civil works

Shared works (communication, safety equip.)

Design (double tunnel) and Cost estimates

BCD – TDP1

- FY2005 – 2008 Asian CFS Team -

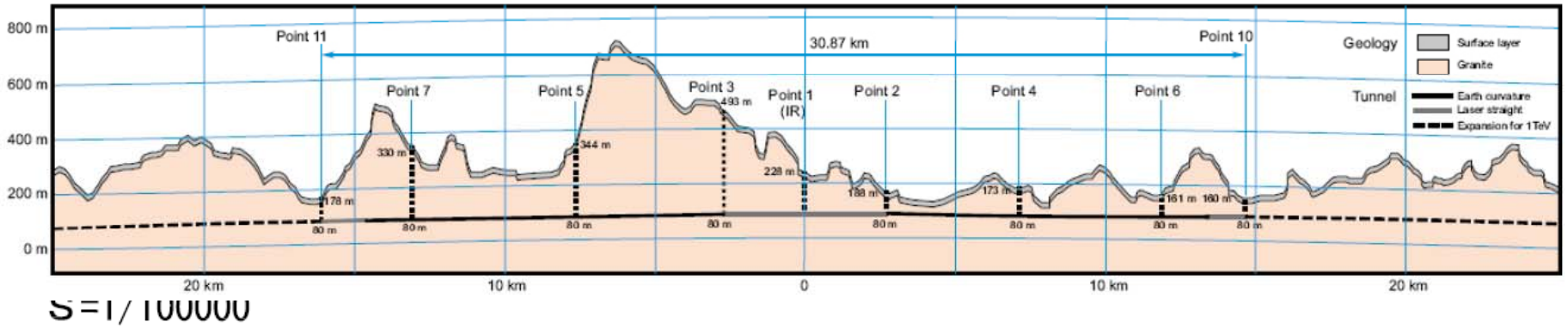


Study Items between 2005 to 2009 -

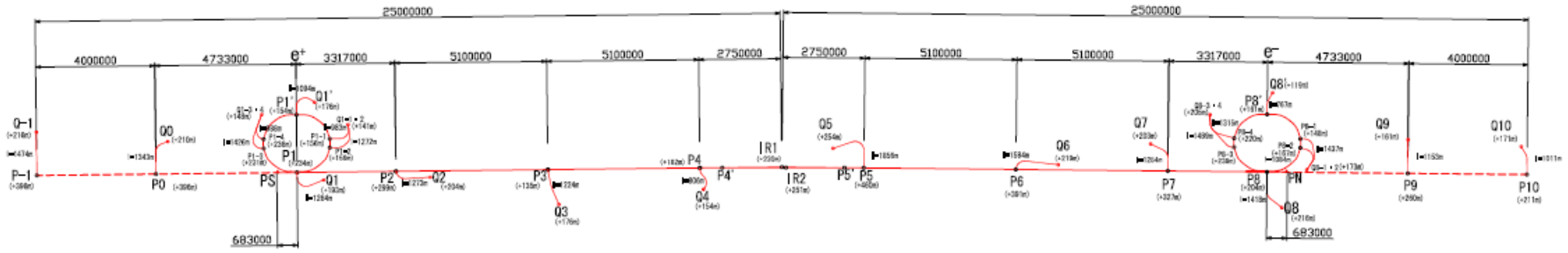
CFS Design Activity	FY	2005	2006	2007	2008	2009	2010	2011	2012
	Phase	BCD	RDR	RDR/TDP1	TDP1	TDP1	TDP1/TDP2	TDP2	TDP2
(Siting)									
Study for ILC 50 km sites		Study							
Tunnel excavation		Study							
Site geology		Study							
Access shafts/tunnels configuration									
Technical review for site candidates	(JSCE)		Review						
(Facility)									
Study for ILC conventional facilities (1)		BCD							
Study for ILC conventional facilities (2)			RDR						
Value engineering for RDR									
Implementation for electric substations									
Civil engineering review (1)	(JSCE)		Review	Review					
Civil engineering support activity (1)	(LCFJ)	Study	Study						
Civil engineering support activity (2)	(AAA)								

JSCE: Japanese Society of Civil Engineers
LCFJ: Linear Colider Forum in Japan
AAA: Advanced Accelerator Association Promoting Science and Technology

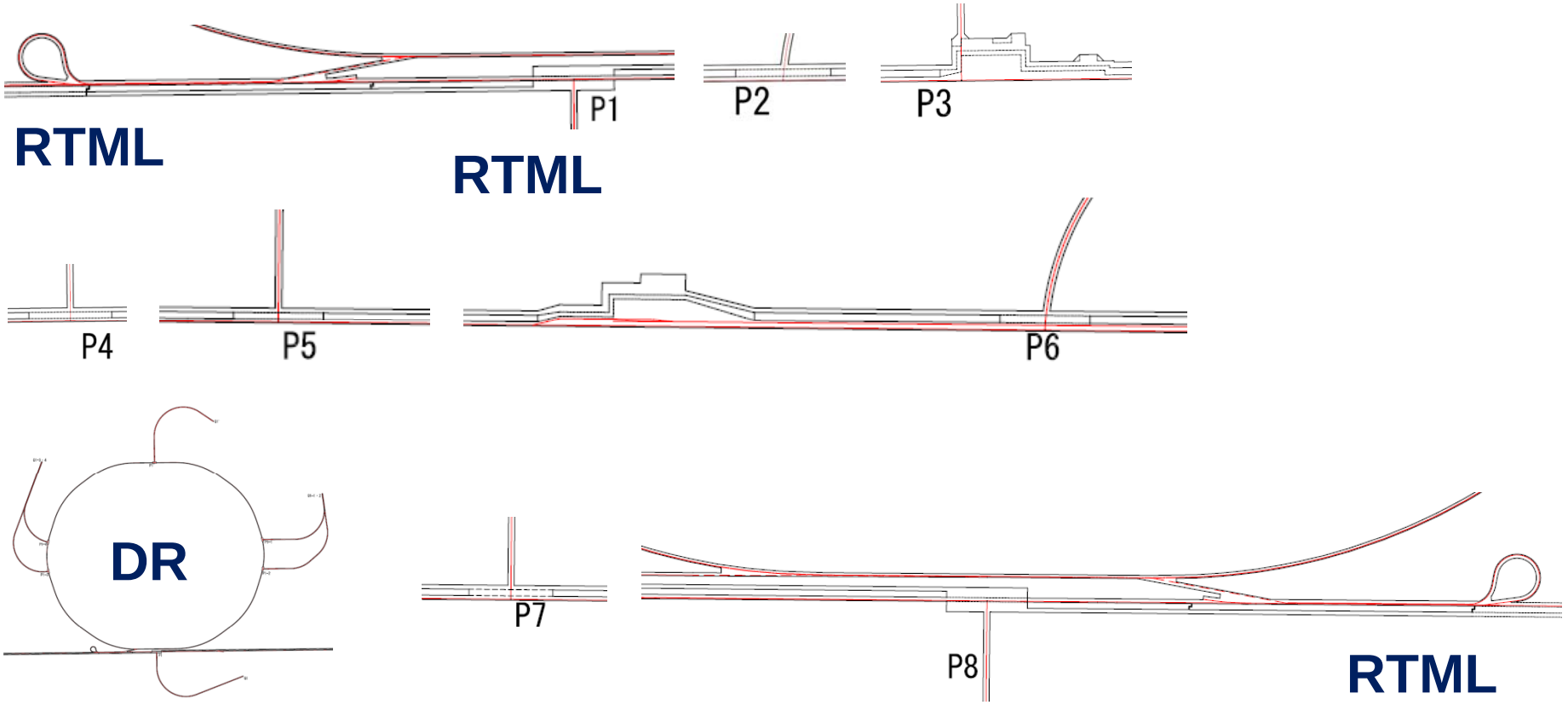
Development of ILC Layout at Sample Site



S = 1 / 100000



Ex. Design of Underground Structures



Ex. Design of Underground Structures

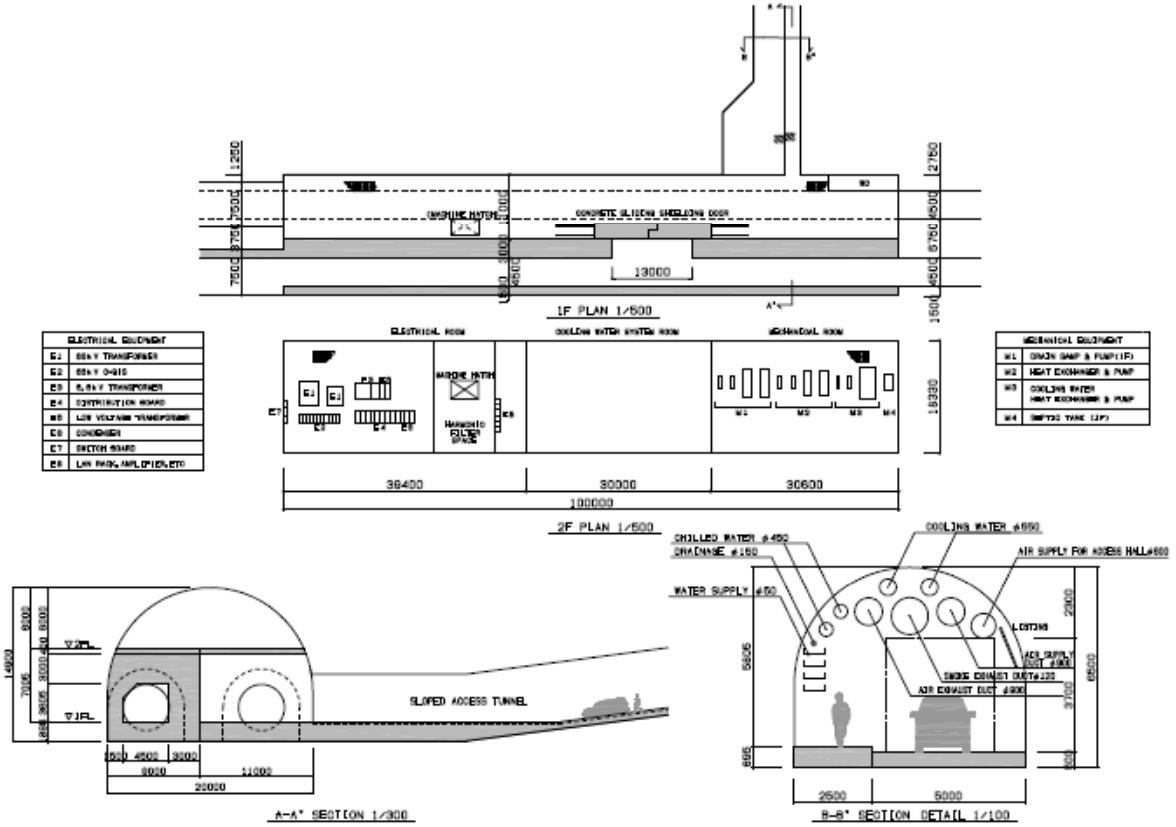


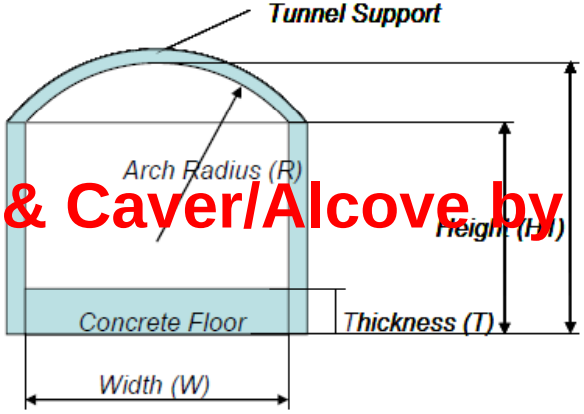
FIGURE 5.3-1. Detail of an access ramp for the Asian Sample Site.

Establish Tunnel and Cavern Unit Costs

Items | Spec. | Unit Cost

CE UNIT COST

Access Shafts			(k¥/m)
16m diameter	16m diameter shaft, "step-by step" Double-lining of 1.1m thick		
14m diameter	14m diameter shaft, "step-by step" Double-lining of 1.1m thick		
9m diameter	9m diameter shaft, "step-by step" Double-lining of 1.1m thick		
4m diameter (place holder)	4m diameter shaft, "step-by step" Double-lining of 1.1m thick		
1.50m diameter	1.15m diameter shaft, "raise borer" Steel pipe.		
Access (Sloped) Tunnel by NATM (Blast & Drill)	Horseshoe W(m) X H(m), R(m), T(m)	A(m2)	
Soil deep to ~5m, D class rock down to ~20m	W(7.5)H(6.5)R(3.75)T(0.5x5m,0.195x2.5m (deepest surface ~100m-)	42.7	
B-class hard rock deeper than ~20m	W(7.5)H(6.5)R(3.75)T(0.5x5m,0.195x2.5m (deepest rock)	42.7	
Beam/Service Tunnel & Alcove by NATM	Horseshoe W(m) X H(m), R(m), T(m)	A(m2)	
4.5m Beam/Service Tunnel	W(4.5)H(4.5)R(2.25)T(1.145)	18.1	
TBM start point		46.5	
BDS IR2 (Chunk at tunnel branch)		18.1	
BDS IR2		32.3	
5GeV Injector Beam Tunnel		32.3	
5GeV Injector Beam/Service Tunnel		150.9	
5GeV Injector Beam/Service Tunnel		126.2	
UND beam tunnel alcove		244.7	
UND beam tunnel alcove		57.5	
UND beam tunnel alcove		43.5	
KAS beam cavern		255.3	
KAS beam cavern		86.3	
Laser Room		87.9	
UND bservice tunnel alcove		108.7	
UND bservice tunnel alcove		22.3	
KAS service tunnel		29.8	
KAS service tunnel		96.5	
KAS service tunnel		73.2	
KAS service tunnel		76.1	
Beam Dump Hall	W(20)H(10)R(12.5)T(1.895)	169.9	
Tunnel by TBM			
4.5m Beam/Service Tunnel (short)	D=4.5m, TBM (short run), 1.145m high concrete floor	15.9	
4.5m Beam/Service Tunnel (long)	D=4.5m, TBM (long run), 1.145m high concrete floor	15.9	
5m Beam Tunnel (long)	D=5m, TBM	19.6	
Housing			
Platform for the shaft-base caverns (16m wide)			



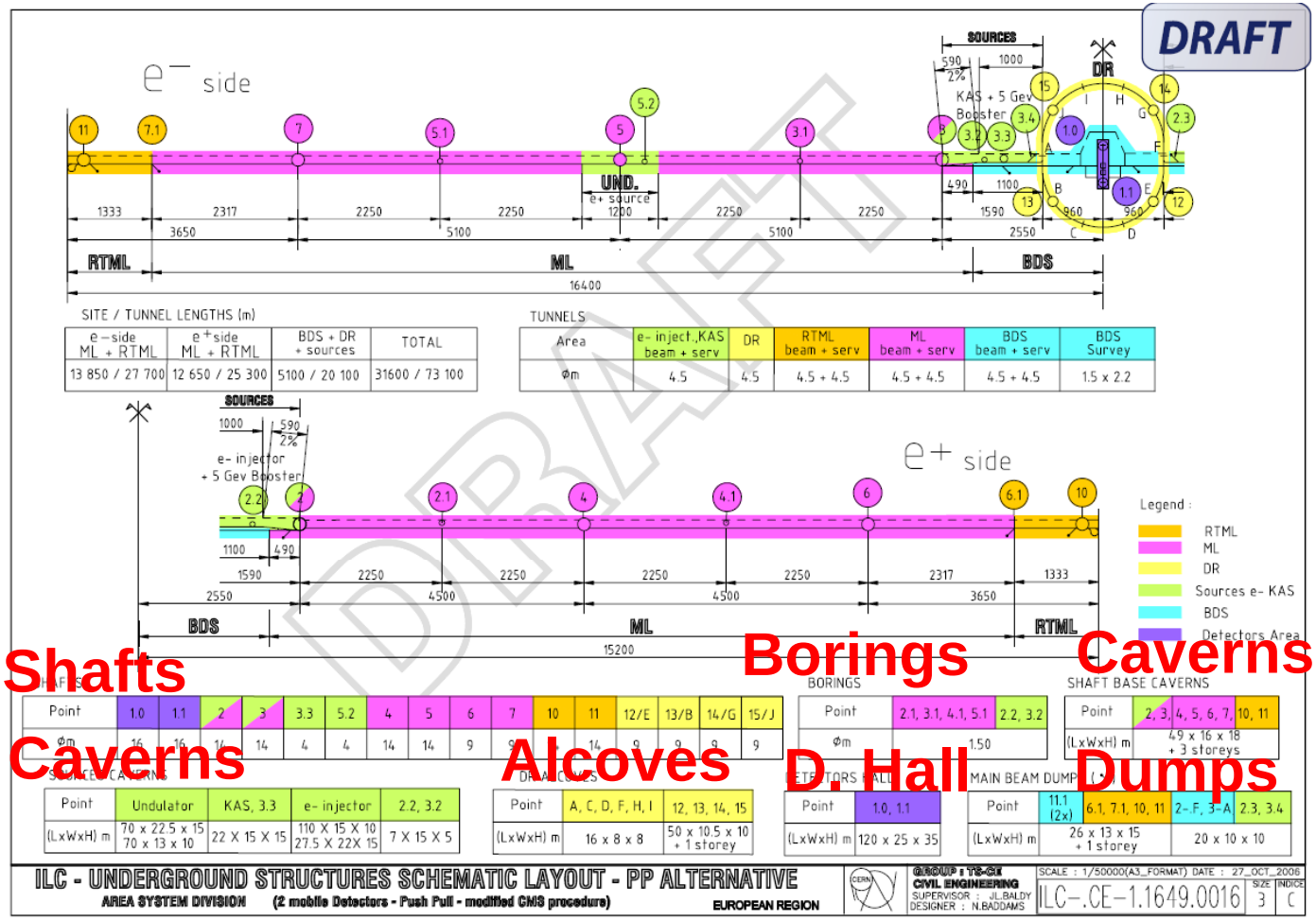
Shafts

Horizontal (Sloped) Tunnel by NATM

Tunnel & Caver/Alcove by NATM

Tunnel by TBM

Cost Estimation Scope for Civil in RDR



Cost Estimate WBS in RDR

Estimate Items Unit Costs Values

Code	Item	Description	Unit	Unit Cost k¥
17	Conventional Facilities			
171	Civil Engineering			
1711	Engineering, study work and documentation			
17111	In-house Engineering	Distribute 952kman-hours (80peraonsX1700hX7years) with the budget rates		
17112	Outsource consultancy	10%(underground civil engineering), 5%(others)		
1712	Underground Facilities			
17121	Shafts			
17122	Tunnels			
171221	Beam Tunnels			
1.7E+07	e-RTML(Turnaround)	Horseshoe shape, 4.5m wide, 4.5m high, NATM, 1.146m high concre	length m	
1.7E+07	e-RTML(P11 to Turnaround)		length m	
1.7E+07	e-RTML P11 (P7.1 side)	Horseshoe shape, 7m wide, 6.5m high, NATM	length m	
1.7E+07	e-RTML(P11 to P7.1)	D=4.5m, TBM, 1.145m high concrete floor	length m	
1.7E+07	e-Main linac(P7.1 to P7)		length m	
1.7E+07	e-Main linac P7 (P5 side)	Horseshoe shape, 7m wide, 6.5m high, NATM	length m	
1.7E+07	e-Main linac(P7 to P5)	D=4.5m, TBM, 1.145m high concrete floor	length m	
1.7E+07	e+ Source (UNDULATOR)		length m	
1.7E+07	e-Main linac P5 (P3 side)	Horseshoe shape, 7m wide, 6.5m high, NATM	length m	
1.7E+07	e+ Source (UNDULATOR)	D=4.5m, TBM, 1.145m high concrete floor	length m	
1.7E+07	0.4GeV e+ Source (tunnel alcove 154m))			
1.7E+07	e-Main linac(P5 to P3)	D=4.5m, TBM, 1.145m high concrete floor	length m	
1.7E+07	e- 5GeV/ e+ 0.4GeV beam line	Horseshoe shape, 4.5m wide, 4.5m high, NATM, 1.145m high concre	length m	
1.7E+07	0.4 GeV Keep Alive Source (see tunnel alcove =167m)			
1.7E+07	e+ 4.6GeV Booster		length m	
1.7E+07	e+ 5GeV Injection line		length m	
1.7E+07	e- 5GeV Extraction line		length m	
1.7E+07	e-5GeV damping ring	D=5m, TBM	length m	
1.7E+07	e-BDS 14mrad beamline	D=4.5m, TBM, 1.145m high concrete floor	length m	
1.7E+07	(IR)		length m	
1.7E+07	e+BDS Survey tunnel	1.5m wide, 2.2m high, excavated by handbreaker	length m	
1.7E+07	e+BDS 14mrad beamline	D=4.5m, TBM, 1.145m high concrete floor	length m	
1.7E+07	e+BDS P2 (BDS side)	Horseshoe shape, 7m wide, 6.5m high, NATM	length m	
1.7E+07	e+ 5GeV Extraction line	Horseshoe shape, 4.5m wide, 4.5m high, NATM, 1.145m high concrete floor	length m	
1.7E+07	e- 5GeV Injection line		length m	
1.7E+07	e-4.6GeV booster		length m	
1.7E+07	e-0.07GeV beam analizer	Horseshoe shape, 7.5m wide, 5m high, NATM, 1.145m high	length m	
1.7E+07	70MeV e-Pre-injector	Horseshoe shape, **10m** wide, 6.5m high, NATM, 1.145m high	length m	
1.7E+07	Concrete shield	Concrete wall	length m	
1.7E+07	Gun Room	Horseshoe shape, 16.2m wide, 9m high, NATM, 1.145m high	length m	
1.7E+07	e+ 5GeV beamline	Horseshoe shape, 4.5m wide, 4.5m high, NATM, 1.145m high concrete fl	length m	
1.7E+07	e+Main linac(P4 to P2)	D=4.5m, TBM, 1.145m high concrete floor	length m	
1.7E+07	e+Main linac(P6 to P4)		length m	
1.7E+07	e+Main linac P6 (P4 side)	Horseshoe shape, 7m wide, 6.5m high, NATM	length m	
1.7E+07	e+Main linac(P6.1 to P6)	D=4.5m, TBM, 1.145m high concrete floor	length m	
1.7E+07	e+RTML(P10 to P6.1)		length m	
1.7E+07	e+RTML P10 (P6.1 side)	Horseshoe shape, 7m wide, 6.5m high, NATM	length m	
1.7E+07	e+RTML(P10 to Turnaround)	Horseshoe shape, 4.5m wide, 4.5m high, NATM, 1.145m high	length m	

TDP1

(2007 ~ 2010)

Value engineering

Ex. Cooling-water system Δt, etc.

→Single-tunnel scheme

Strawman Baseline (SB) 2009

. Single-tunnel + KCS/DRFS

. Central region rework

etc.

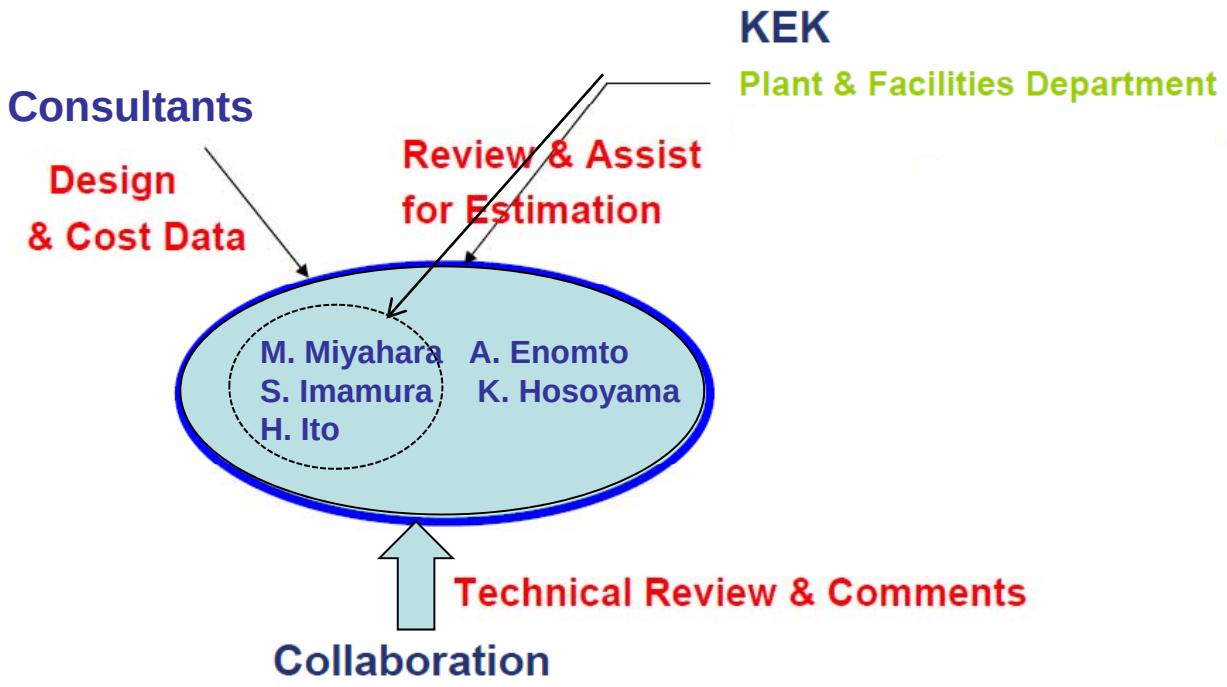
Study Items between 2005 to 2009 -

CFS Design Activity	FY	2005	2006	2007	2008	2009	2010	2011	2012
	Phase	BCD	RDR	RDR/TDP1	TDP1	TDP1	TDP1/TDP2	TDP2	TDP2
(Siting)									
Study for ILC 50 km sites		Study							
Tunnel excavation		Study							
Site geology		Study							
Access shafts/tunnels configuration						Rework			
Technical review for site candidates	(JSCE)		Review						
(Facility)									
Study for ILC conventional facilities (1)		BCD							
Study for ILC conventional facilities (2)			RDR						
Value engineering for RDR					Rework				
Implementation for electric substations						Study			
Civil engineering review (1)	(JSCE)		Review	Review					
Civil engineering support activity (1)	(LCFJ)	Study	Study						
Civil engineering support activity (2)	(AAA)					Study			

JSCE: Japanese Society of Civil Engineers
LCFJ: Linear Colider Forum in Japan
AAA: Advanced Accelerator Association Promoting Science and Technology

TDP2

- FY2010 – 2012 Asian CFS Team -



Study Items between 2005 to 2009 -

CFS Design Activity	FY	2005	2006	2007	2008	2009	2010	2011	2012
	Phase	BCD	RDR	RDR/TDP1	TDP1	TDP1	TDP1/TDP2	TDP2	TDP2
(Siting)									
Study for ILC 50 km sites		Study							
Tunnel excavation		Study							
Site geology		Study							
Access shafts/tunnels configuration						Rework			
Technical review for site candidates	(JSCE)		Review						
(Facility)									
Study for ILC conventional facilities (1)		BCD							
Study for ILC conventional facilities (2)			RDR						
Value engineering for RDR					Rework				
Implementation for electric substations						Study			
Civil engineering review (1)	(JSCE)		Review	Review					
Civil engineering support activity (1)	(LCFJ)	Study	Study						
Civil engineering support activity (2)	(AAA)					Study			

JSCE: Japanese Society of Civil Engineers
LCFJ: Linear Colider Forum in Japan
AAA: Advanced Accelerator Association Promoting Science and Technology

Summary of TDP2 Basic Plan
(2010 ~ 2012)

(1) Single-Tunnel accelerator configuration CFS design will be developed in a couple of Japanese potential sites.

(2) Both DRFS and KCS will be considered as HLRF scheme, while concentrating on DRFS, because of our limited resource.

(3) More comprehensive design will be pursued involving all CFS works (civil, electric, mechanical, etc.) for all area systems.

(4) The expected output is a realistic design, which meets mountainous site feature (in most case in Japan), with reasonable construction costs and schedules based on necessary CFS drawings.

(5) These works will be combined into the TDP2 ILC design including a regional design alternative and cost estimate to be more reliable.