Chapter 0

Why Fluid Mechanics?

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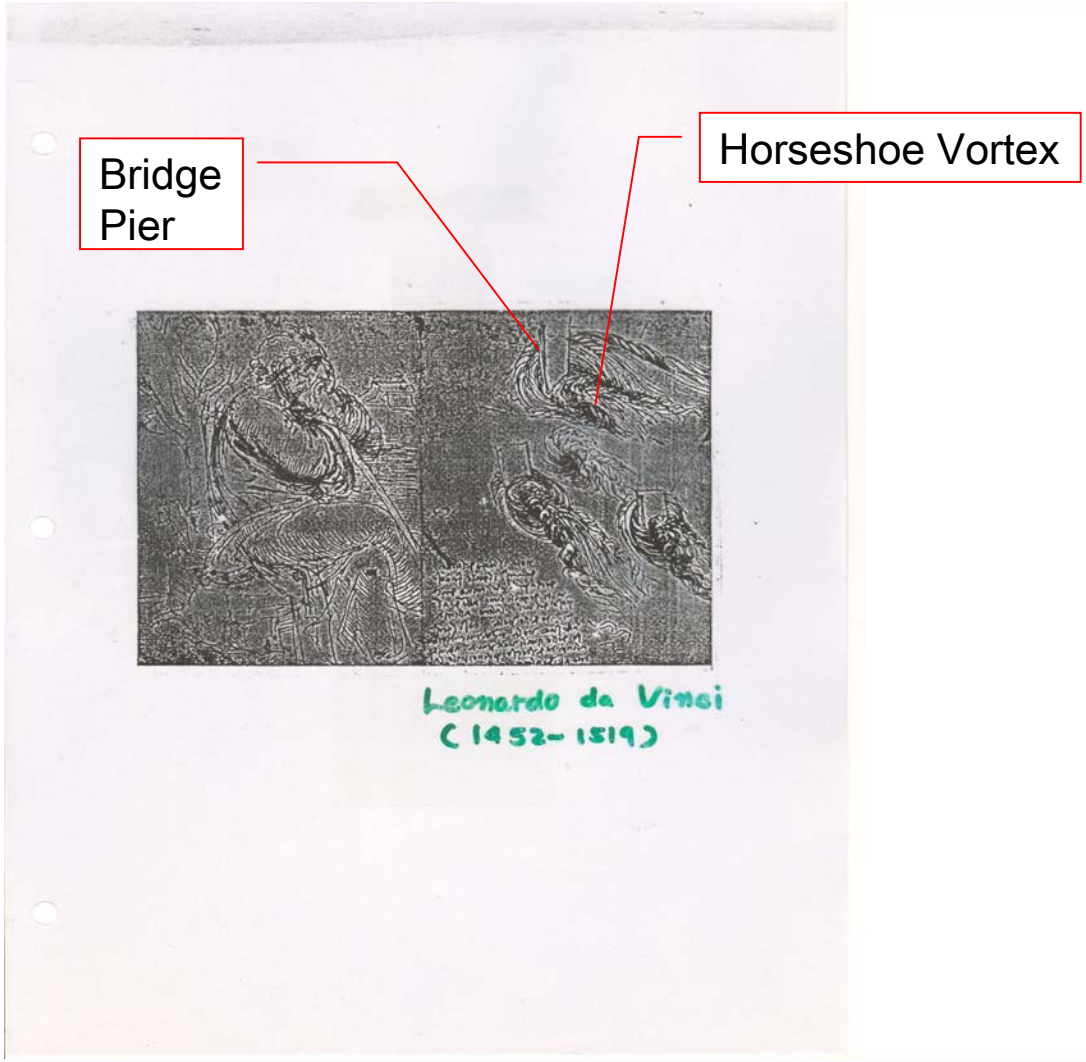
Contents

Chapter 0 Why Fluid Mechanics?

Objectives

- Show your motivation to attend this class
- Introduce practical applications of fluid mechanics

0.1 Speculation of Leonardo da Vinci

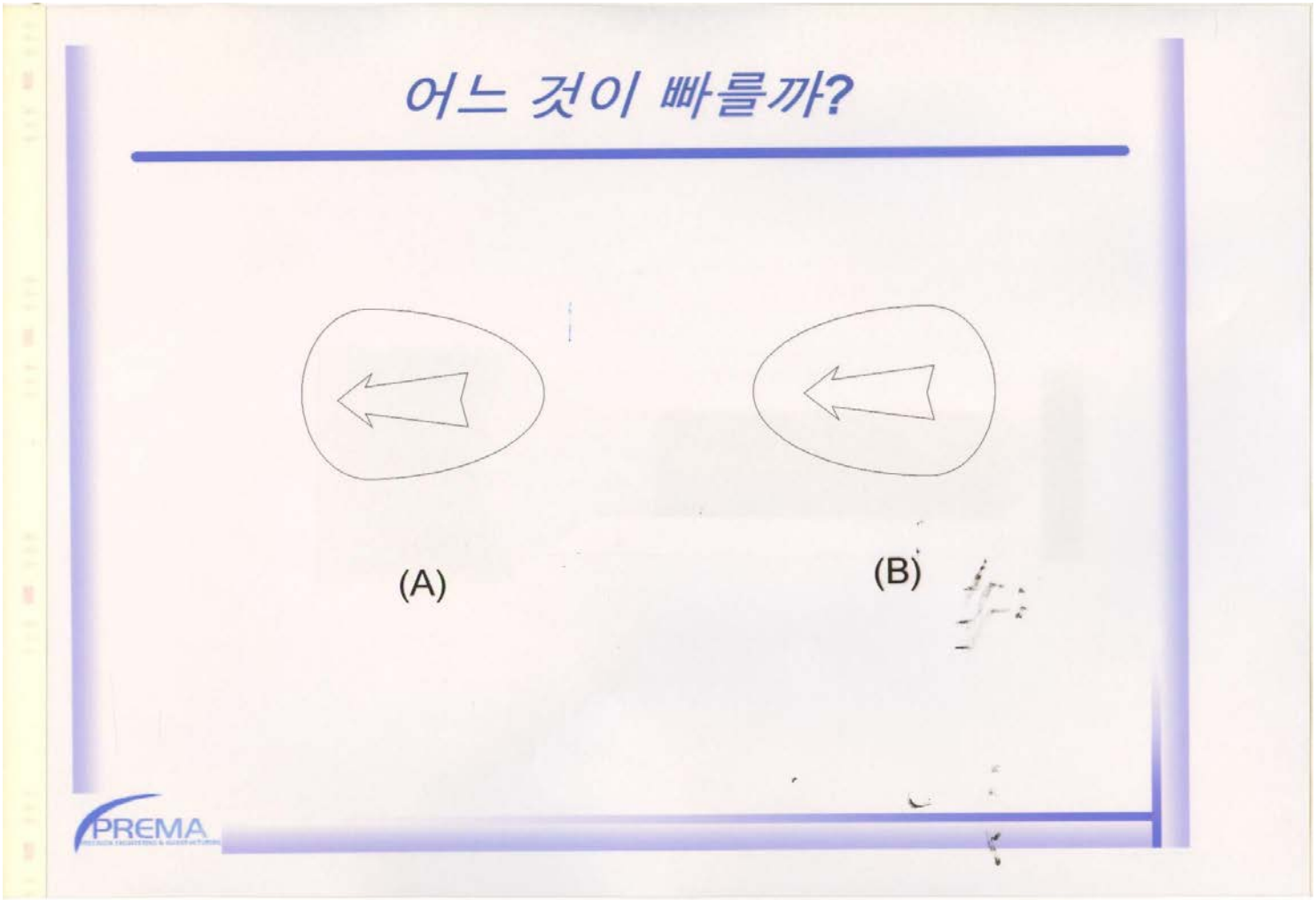


0.1 Speculation of Leonardo da Vinci

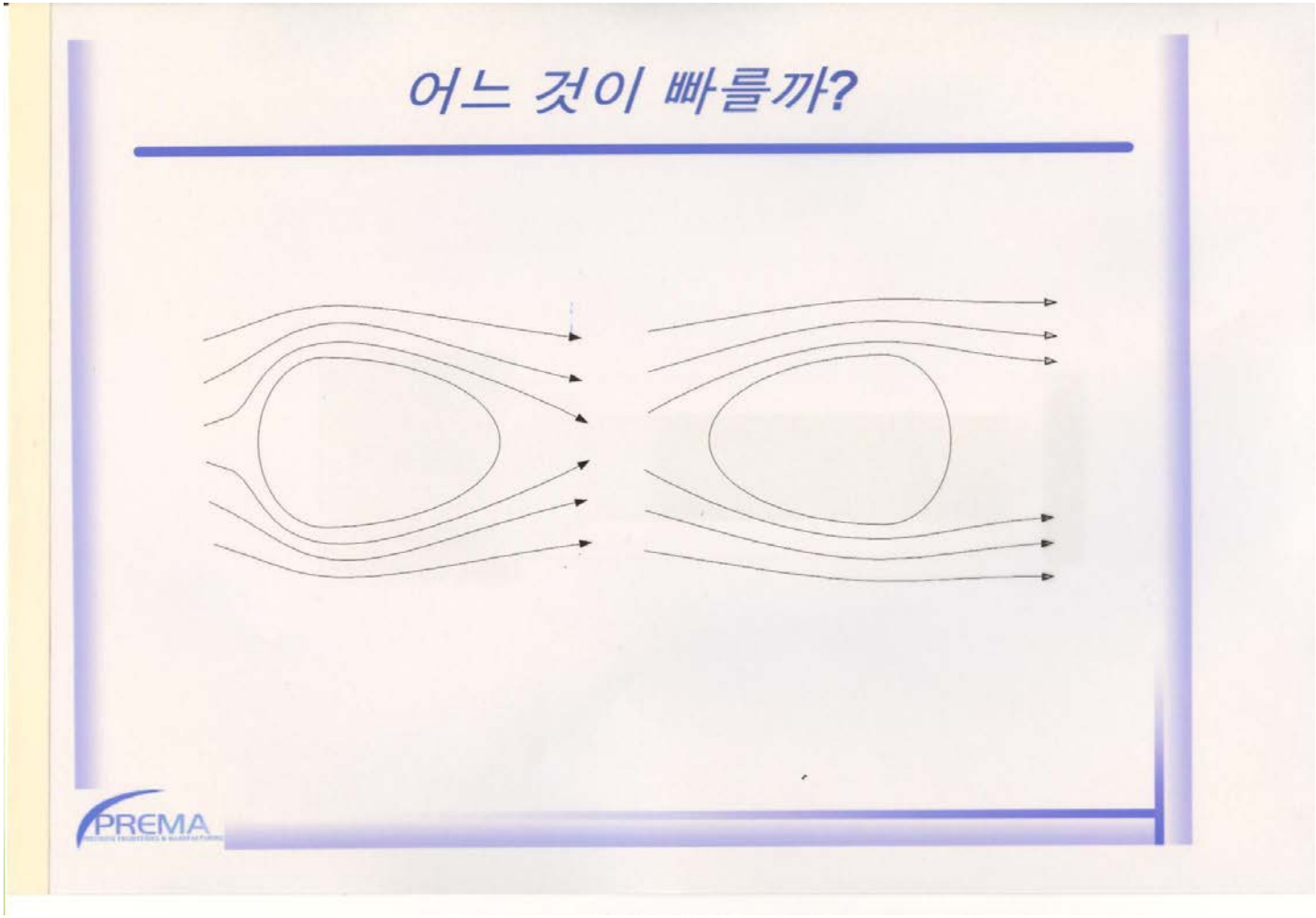
그림 1-1 Leonardo da Vinci와 그가 그린 위어에서의 물흐름

0.1 Speculation of Leonardo da Vinci

0.2 Physics of Golf



0.2 Physics of Golf



0.2 Physics of Golf

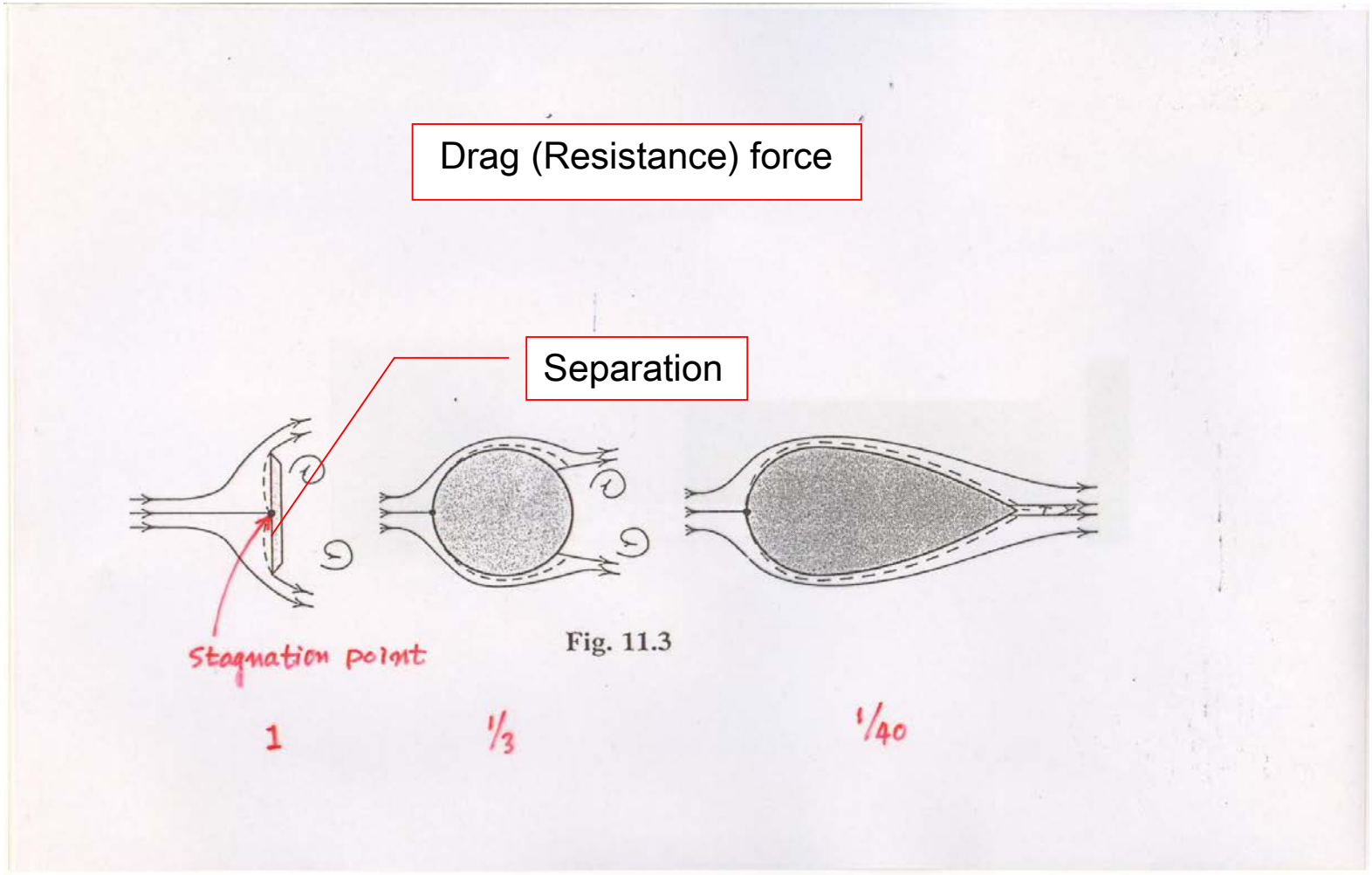
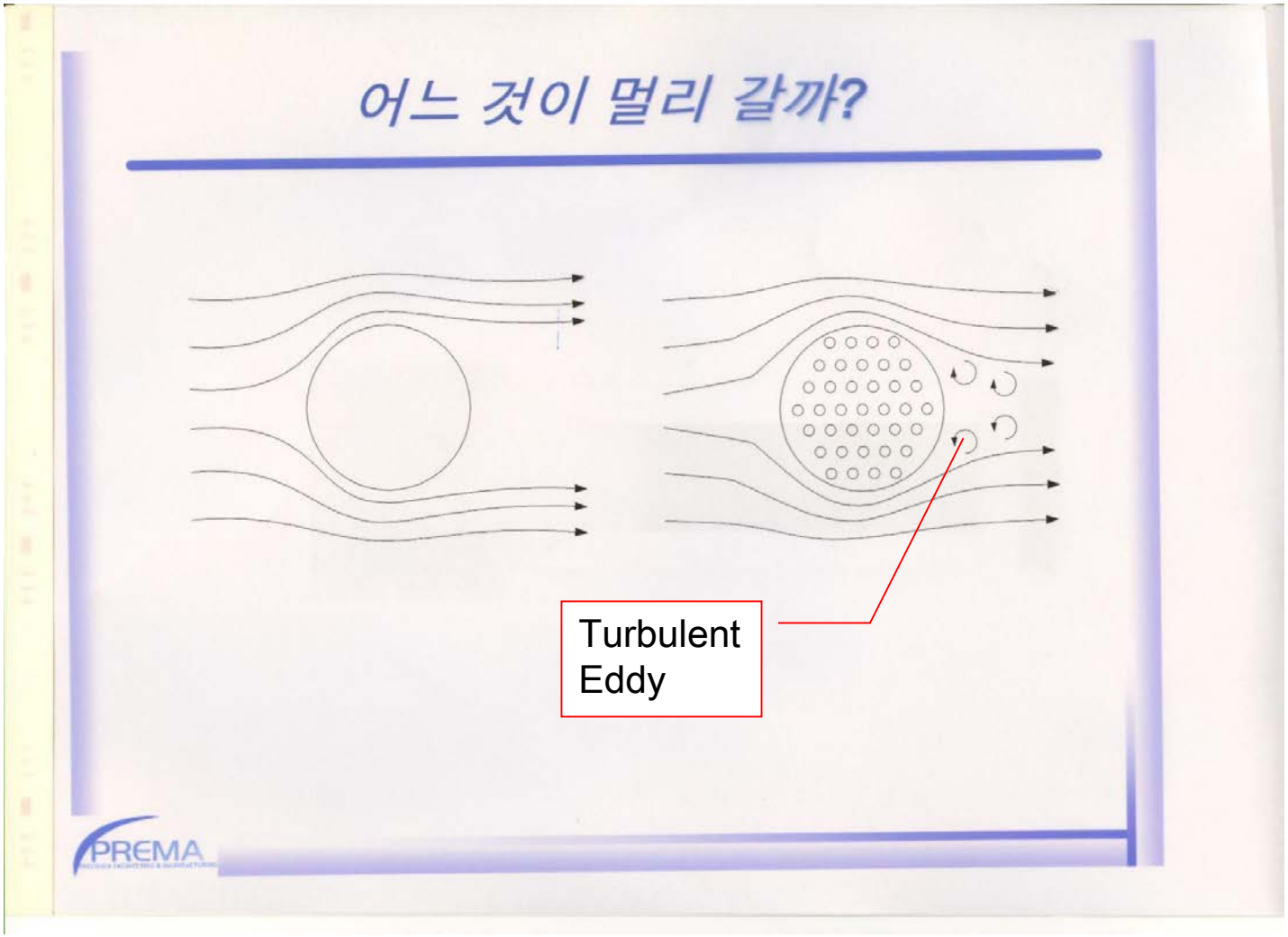


Fig. 11.3

0.2 Physics of Golf

0.2 Physics of Golf



0.2 Physics of Golf

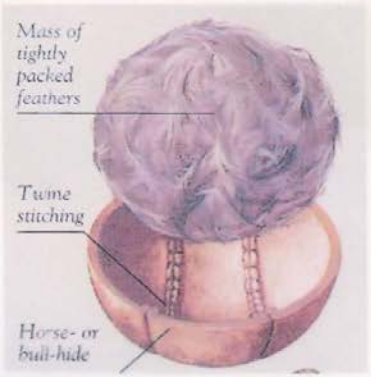
Scarred ball

Guttie ball

Dimple ball

0.2 Physics of Golf

Feathery Ball



Last feathery made by Robertson, in 1852

PREMA

0.2 Physics of Golf

Guttie Ball

Smooth ball made by Robertson in 1852

Red, hand-hammered guttie for use in snow

Hand-hammered Robertson guttie from the 1850s

Guttie ball stamped with a distinctive circle marking

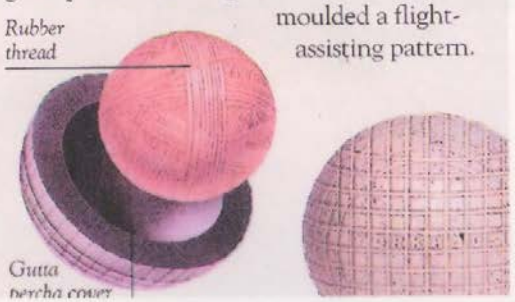
PREMA

0.2 Physics of Golf

Rubber-core Ball

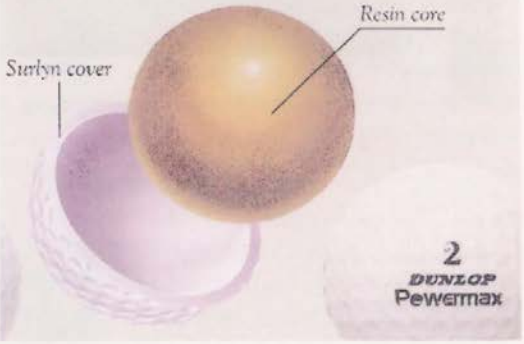
THE RUBBER-CORE BALL

The rubber-core ball, developed by Coburn Haskell in 1898 and first made commercially in 1901, could be hit farther and faster than previous designs. It was made by winding great lengths of rubber yarn, stretched under tension, around a rubber core. A livelier core enabled golfers to exercise more control over the ball's spin and flight. Early models had a gutta percha covering, on to which was moulded a flight-assisting pattern.



TWO-PIECE

A high-energy acrylate or resin core with a tough cut-proof blended cover gives the two-piece more length than any other ball. It is also virtually indestructible which, with its top roll distance, makes it by far the most popular ball among ordinary golfers. However, because it has a lower spin rate, it is less easy to control.



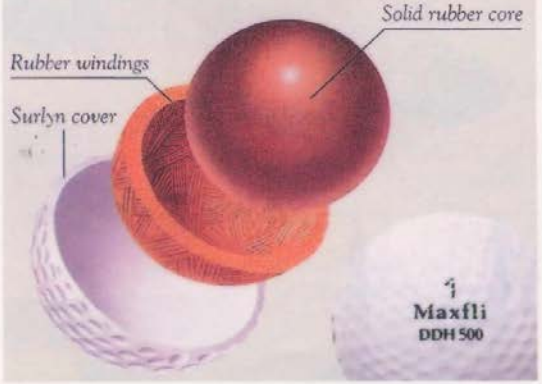
PREMA

0.2 Physics of Golf

Rubber-core Ball

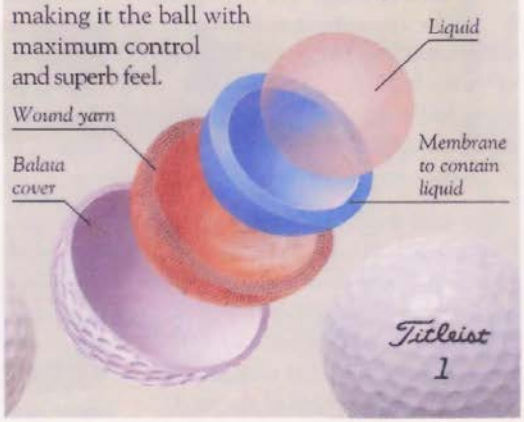
THREE-PIECE (SURLYN COVER)

This version of the three-piece wound ball has a solid rubber core over which rubber yarn is wound for good control. The cover is made from Surlyn, a thermoplastic resin that is harder than balata and is thus considerably more durable; it is virtually uncuttable.



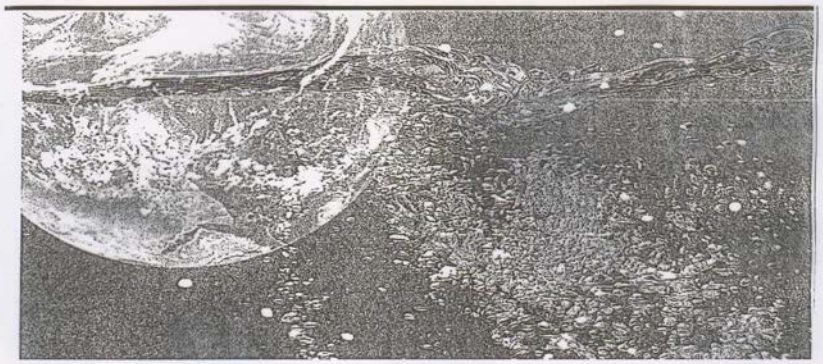
THREE-PIECE (BALATA COVER)

The balata-covered, liquid-centred three-piece ball might be described as the most advanced of golf balls. The wound construction over a liquid centre, combined with a soft, synthetic balata cover, produces the highest spin rate, making it the ball with maximum control and superb feel.



PREMA

0.3 Water Resources



물 수요-공급 전망		(단위 : 억톤)
	2001	2011
물수요량	337.4	370.0
물공급량	338.0(100%)	351.6
지하수	158.8(47%)	164.8
댐	147.8(44%)	152.1
지표수	31.5(9%)	34.8
물공급-수요량	0.6	-18.4

← 물 부족량

Water Shortage

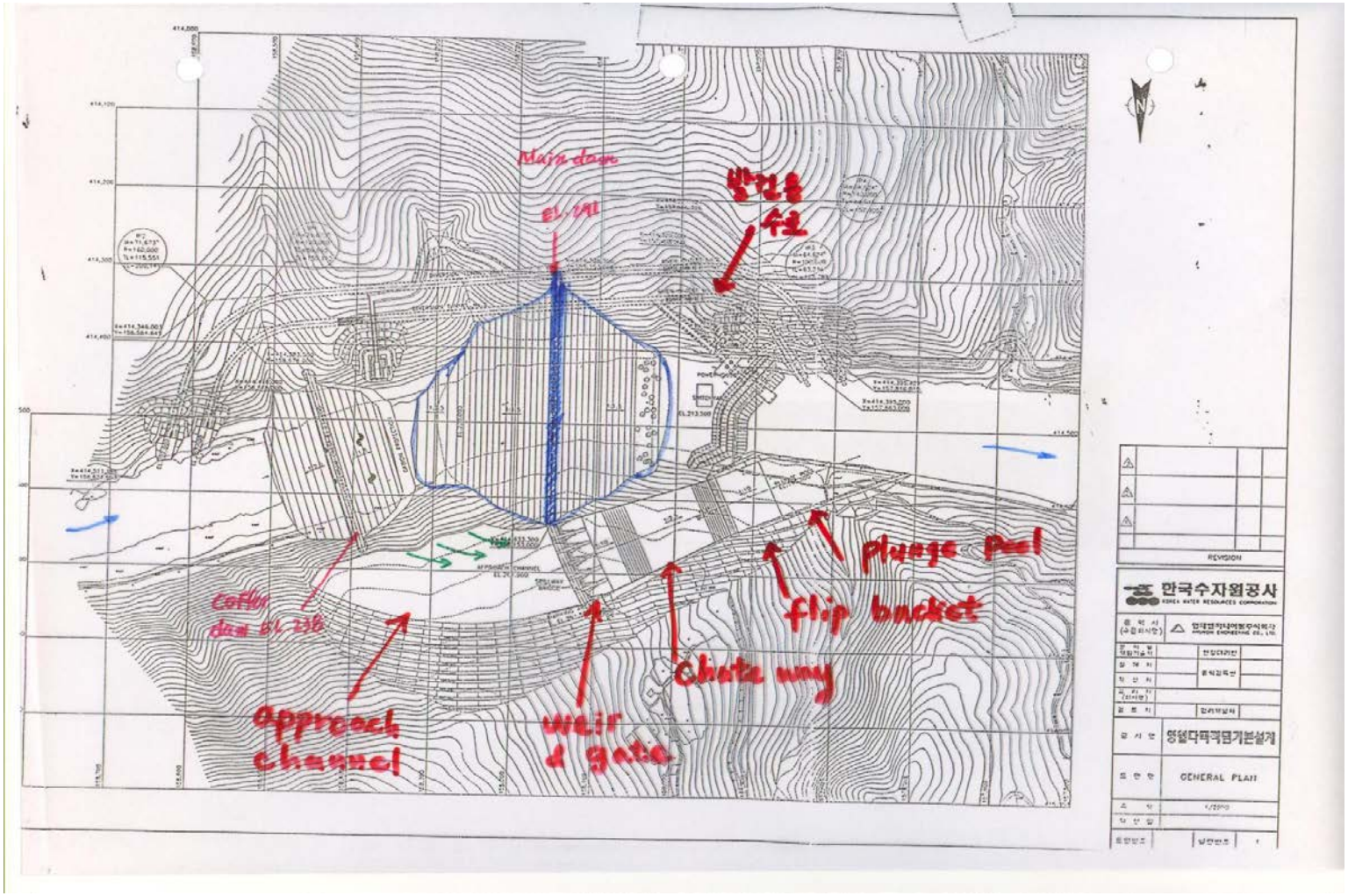
0.4 Dams

0.4 Dams

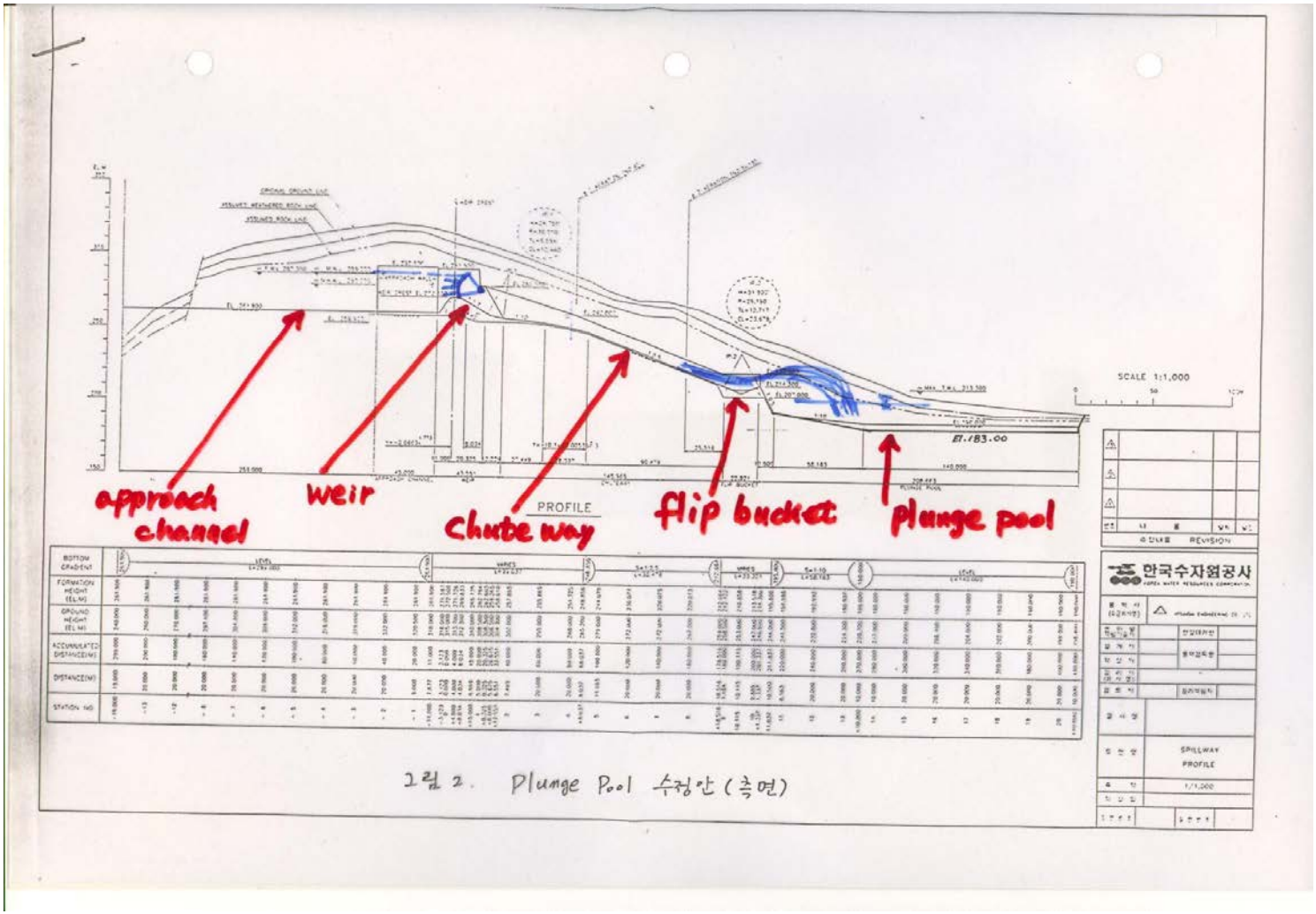
0.4 Dams

그림2.4 장성 농업용 댐(영산강) Changseong Irrigation Dam(Yeongsan R.)

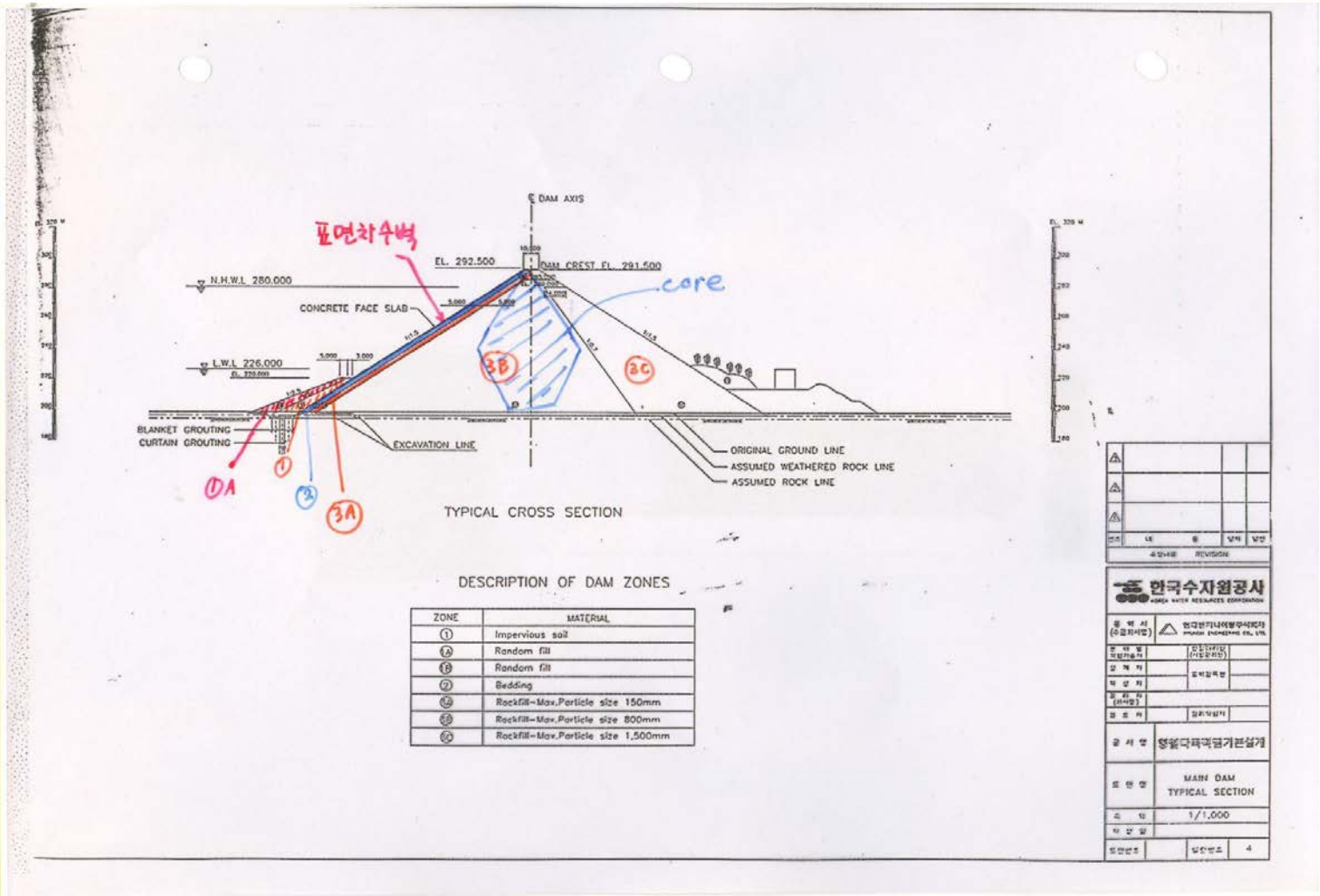
0.4 Dams


Main dam
EL. 241
방전용 수로
Cofferdam EL. 236
approach channel
weir & gate
chute way
flip bucket
plunge pool
한국수자원공사
영월다목적댐기본설계
GENERAL PLAN

0.4 Dams


approach channel
weir
Chute way
flip bucket
plunge pool
PROFILE
SCALE 1:1,000
El.183.00
한국수자원공사
SPILLWAY PROFILE
그림 2. Plunge Pool 수정안 (측면)

0.4 Dams


표면차수벽
core
DAM AXIS
EL. 292.500
DAM CREST EL. 291.500
N.H.W.L 280.000
CONCRETE FACE SLAB
L.W.L 226.000
BLANKET GROUTING
CURTAIN GROUTING
EXCAVATION LINE
ORIGINAL GROUND LINE
ASSUMED WEATHERED ROCK LINE
ASSUMED ROCK LINE
3A
3B
3C
1A
1
2
TYPICAL CROSS SECTION
DESCRIPTION OF DAM ZONES
ZONE
MATERIAL
① Impervious soil
1A Random fill
1B Random fill
② Bedding
3A Rockfill-Max.Particle size 150mm
3B Rockfill-Max.Particle size 800mm
3C Rockfill-Max.Particle size 1,500mm
한국수자원공사
MAIN DAM
TYPICAL SECTION
1/1,000

0.5 Hydropower Plants

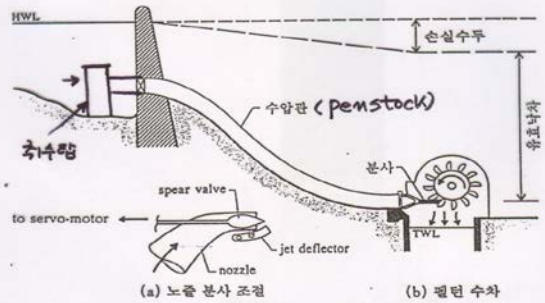


그림 7-12 Pelton 수차(Novak)

0.5 Hydropower Plants

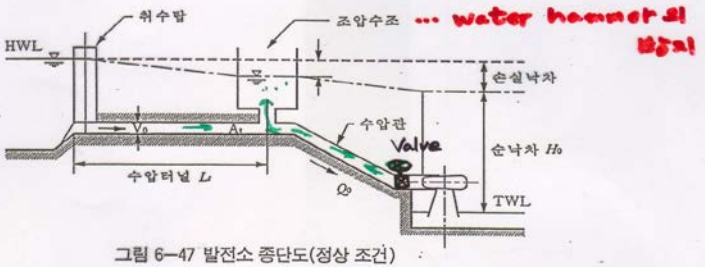


그림 6-47 발전소 종단도(정상 조건)

0.5 Hydropower Plants

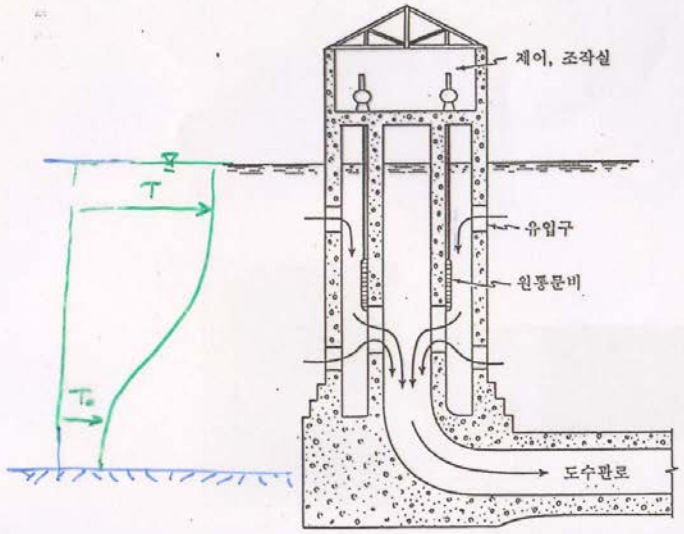
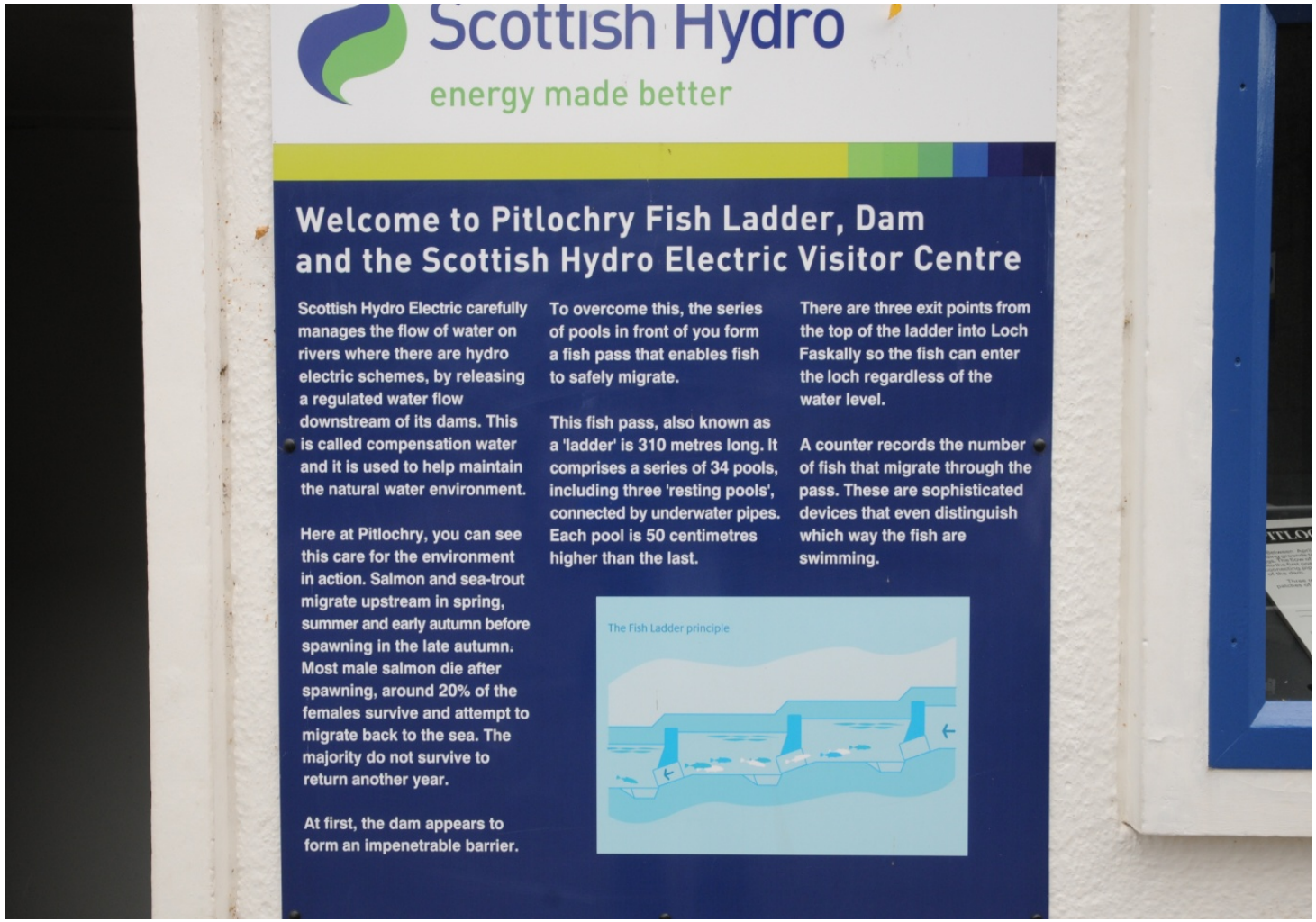
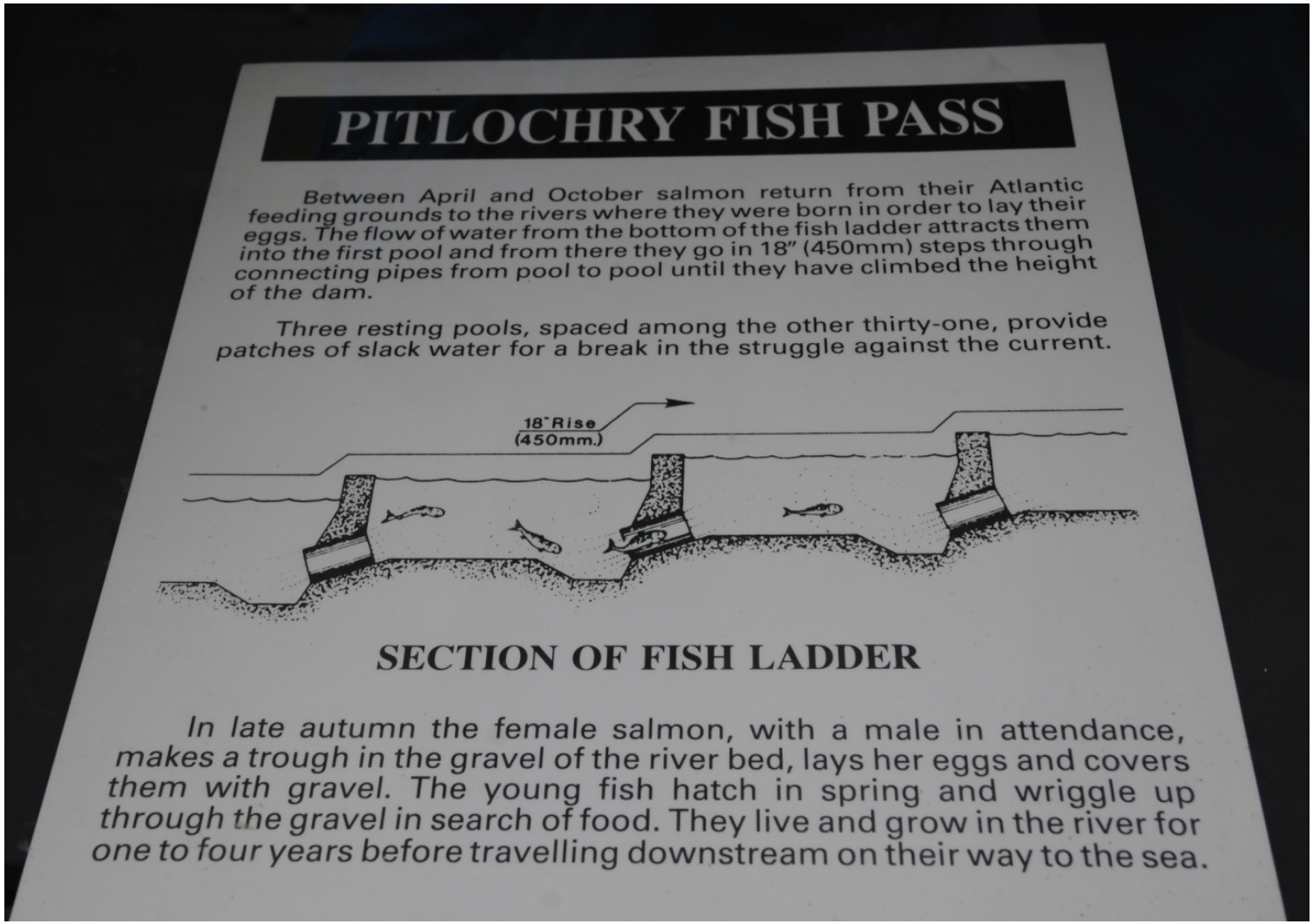


그림 6-23 습식 취수탑 구조(Linsley et al.)

0.5 Hydropower Plants



0.5 Hydropower Plants



PITLOCHRY FISH PASS

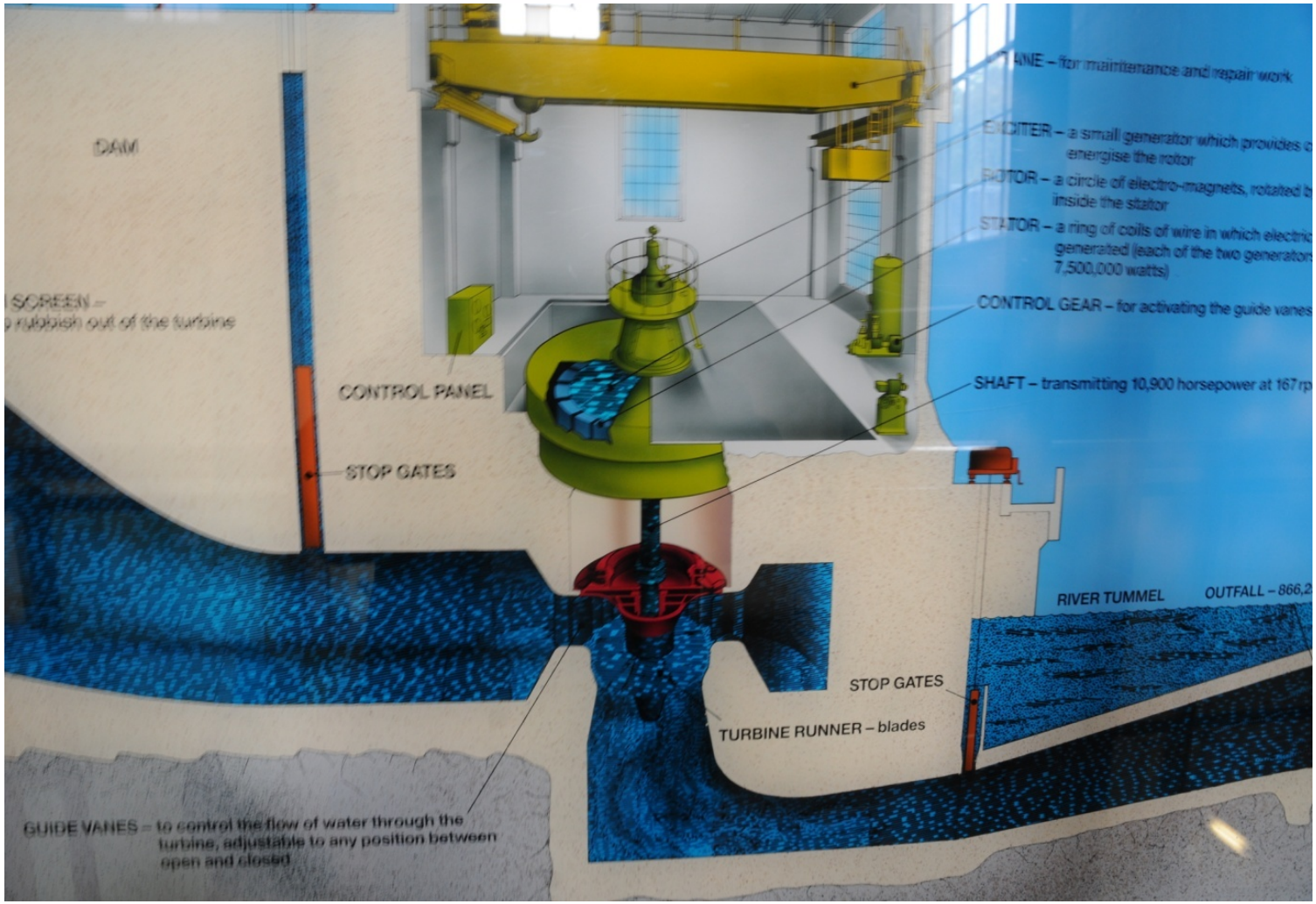
Between April and October salmon return from their Atlantic feeding grounds to the rivers where they were born in order to lay their eggs. The flow of water from the bottom of the fish ladder attracts them into the first pool and from there they go in 18" (450mm) steps through connecting pipes from pool to pool until they have climbed the height of the dam.

Three resting pools, spaced among the other thirty-one, provide patches of slack water for a break in the struggle against the current.

SECTION OF FISH LADDER

In late autumn the female salmon, with a male in attendance, makes a trough in the gravel of the river bed, lays her eggs and covers them with gravel. The young fish hatch in spring and wriggle up through the gravel in search of food. They live and grow in the river for one to four years before travelling downstream on their way to the sea.

0.5 Hydropower Plants



0.5 Hydropower Plants

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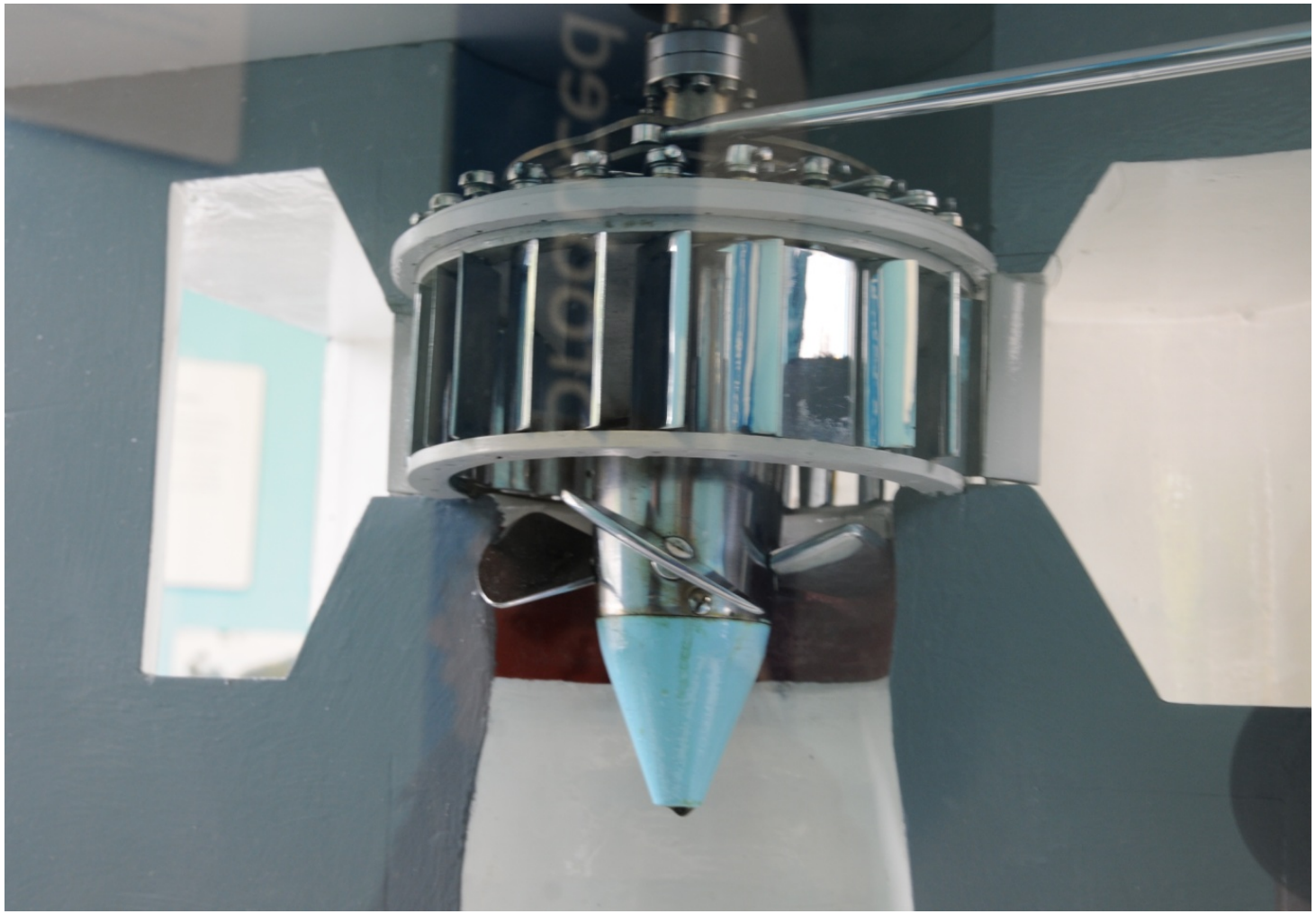


0.5 Hydropower Plants

0.5 Hydropower Plants

0.6 Spillways

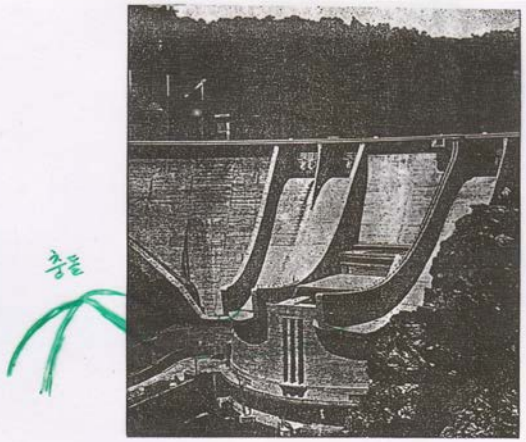


그림 8. 17 스키점프 여수로(프랑스 l'Aigle 댐)

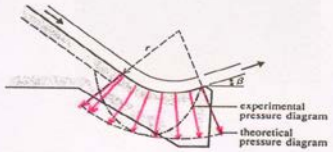


그림 8. 18 버킷부의 설계

0.7 Floods

1990 Flood

그림3.2
가옥 침수(일산, '90)

Inundation of Houses
(Ilsan, '90)

0.7 Floods


1995 Han River Flood
◇흙탕물바다된 올림픽대로
26일 하오 서울 반포대교 남단에서 바라본 잠실쪽 한강변일대. 한강범람위기는 넘겼으나 태풍 재니스의 영향으로 우리나라에는 27일 상오까지 비가 내릴 전망이다. 한강수계의 주요 댐은 26일 저녁까지 방류를 계속했다.
【李鐘哲기자】

0.7 Floods

1995 Han River Flood

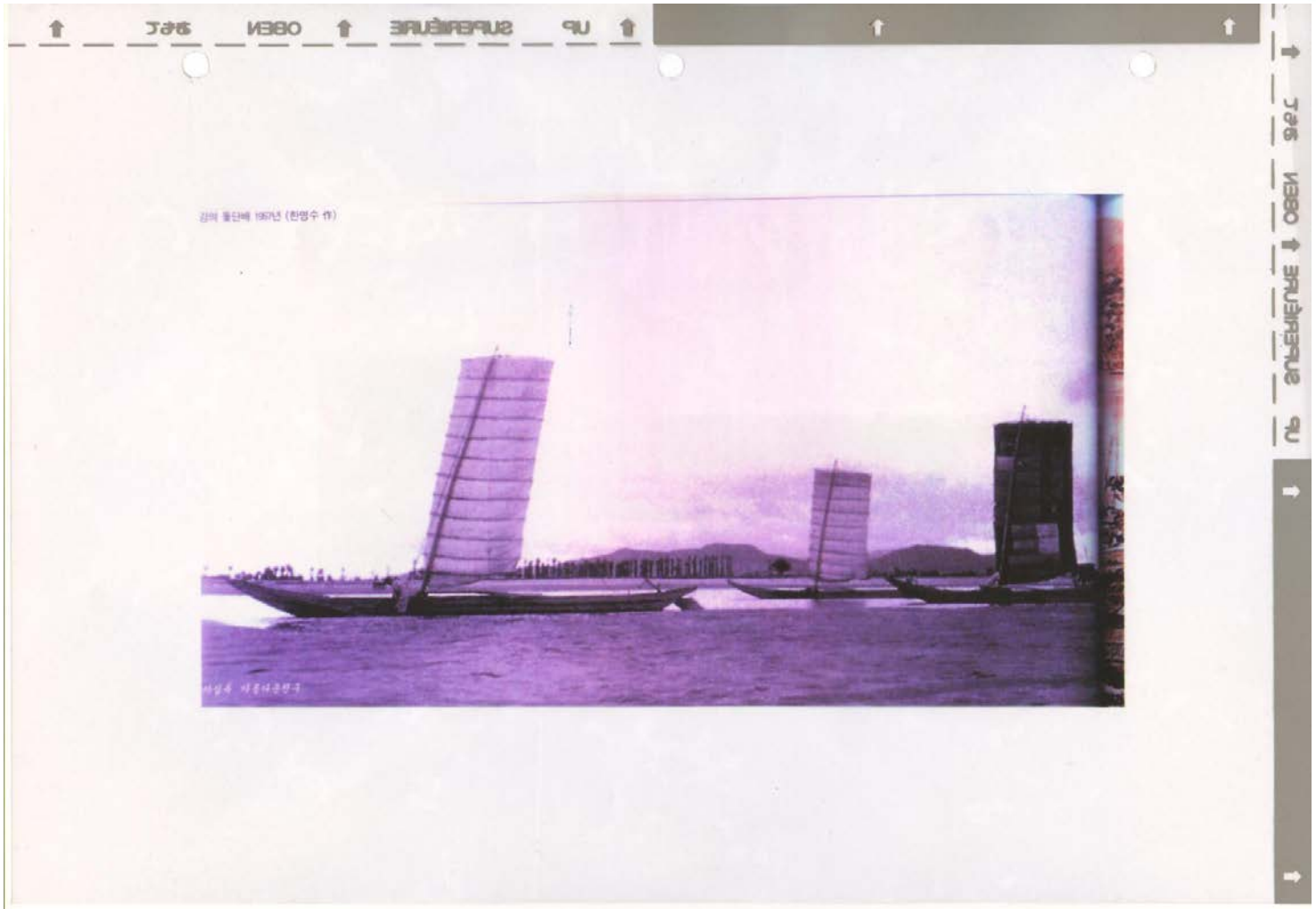
0.7 Floods

1995 Han River Flood

0.8 River Navigation


그림2.6
'90년대의 한강(서울)
The Han River in the '90s (Seoul)

0.8 River Navigation



0.8 River Navigation

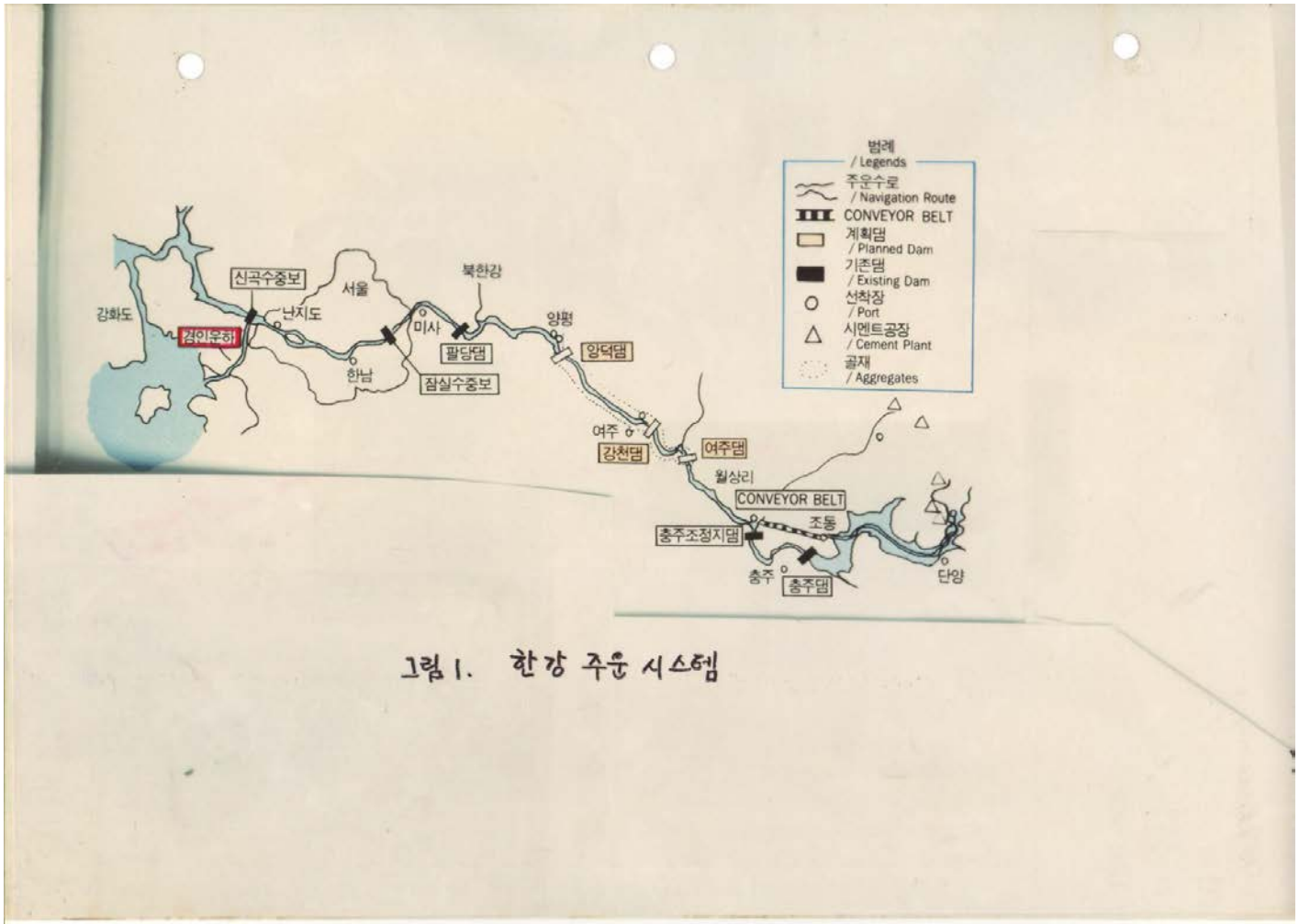
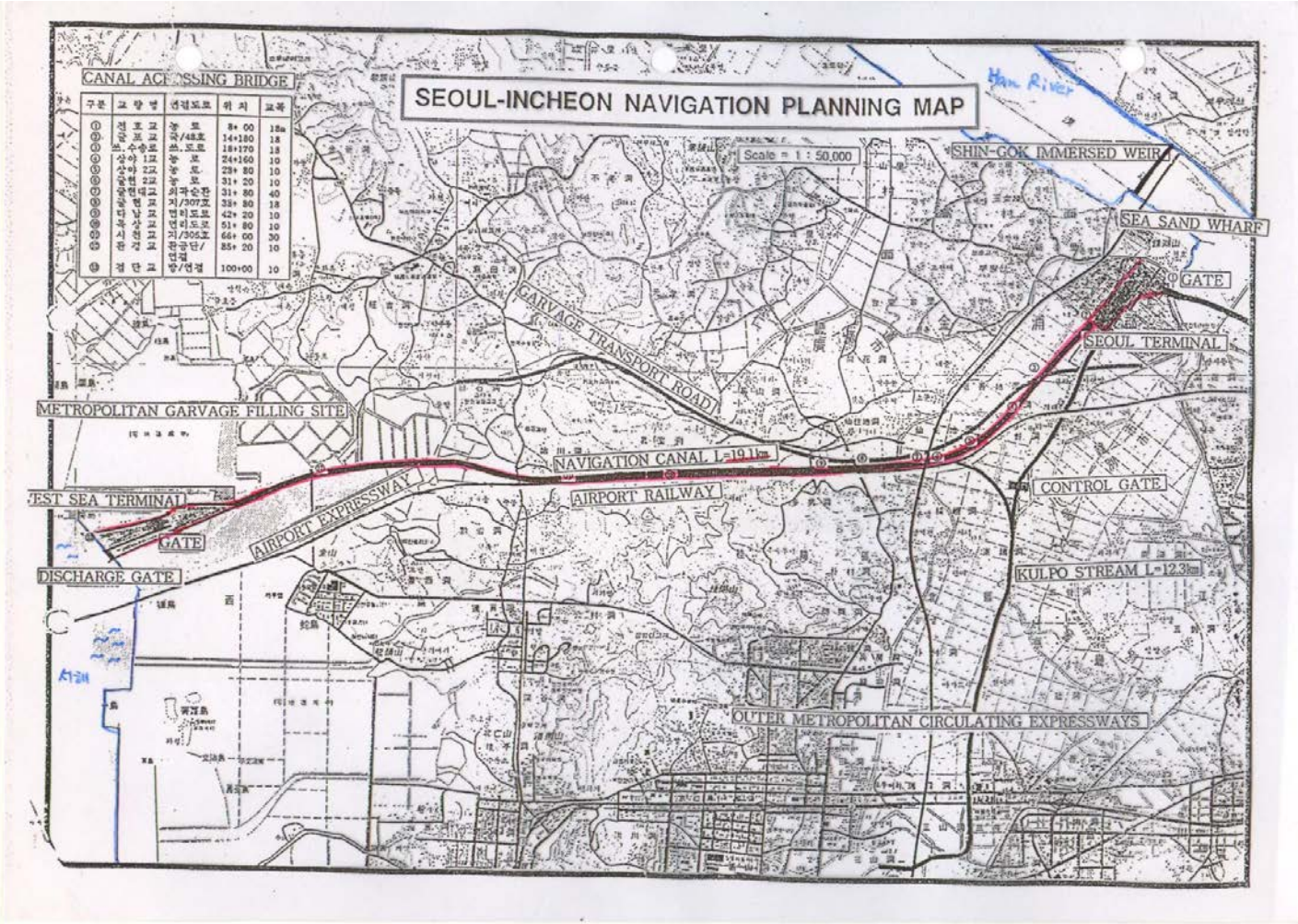


그림 1. 한강 주운 시스템

0.8 River Navigation



0.8 River Navigation

0.9 River Recreation