EMP

ENO	ENAME	TITLE
E1	J. Doe	Elect. Eng
E2	M. Smith	Syst. Anal.
E3	A. Lee	Mech. Eng.
E4	J. Miller	Programmer
E5	B. Casey	Syst. Anal.
E6	L. Chu	Elect. Eng.
E7	R. Davis	Mech. Eng.
E8	J. Jones	Syst. Anal.

ASG

ENO	PNO	RESP	DUR
E1	P1	Manager	12
E2	P1	Analyst	24
E2	P2	Analyst	6
E3	P3	Consultant	10
E3	P4	Engineer	48
E4	P2	Programmer	18
E5	P2	Manager	24
E6	P4	Manager	48
E7	P3	Engineer	36
E8	P3	Manager	40

PROJ

PNO	PNAME	BUDGET	LOC
P1	Instrumentation	150000	Montreal
P2	Database Develop.	135000	New York
P3	CAD/CAM	250000	New York
P4	Maintenance	310000	Paris

PAY

TITLE	SAL
Elect. Eng.	40000
Syst. Anal.	34000
Mech. Eng.	27000
Programmer	24000

Fig. 3.3 Modified Example Database

budgets are less than \$200,000, whereas PROJ_2 stores information about projects with larger budgets. ♦

Example 3.2. Figure 3.5 shows the PROJ relation of Figure 3.3 partitioned vertically into two subrelations, PROJ_1 and PROJ_2. PROJ_1 contains only the information about project budgets, whereas PROJ_2 contains project names and locations. It is important to notice that the primary key to the relation (PNO) is included in both fragments. ♦

The fragmentation may, of course, be nested. If the nestings are of different types, one gets *hybrid fragmentation*. Even though we do not treat hybrid fragmentation as a primitive fragmentation strategy, many real-life partitionings may be hybrid.

3.2.3 Degree of Fragmentation

The extent to which the database should be fragmented is an important decision that affects the performance of query execution. In fact, the issues in Section 3.2.1 concerning the reasons for fragmentation constitute a subset of the answers to the question we are addressing here. The degree of fragmentation goes from one extreme, that is, not to fragment at all, to the other extreme, to fragment to the level of