

## **Establishing a Manufacturing Presence in Asia: Facility Considerations**

**By:**

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### **The Challenge**

If you plan to move your family to a new house in the same town you live in today, the house you buy, whether new construction or resale, would really be a variation on a theme you know well. After all, you know the culture and the neighborhood. The new house would have extra rooms and upgraded features, but you could confidently know you were getting what you expected. If you moved across the country the neighborhood selection would be more difficult but not much else would be very different. However, if you were to move to Asia the story would suddenly get much more complicated. Now you have to take into account a completely different set of building standards, cultural differences, and since you probably won't be taking all the existing furniture, how everything fits together will be a challenge. Not only would the kitchen be designed for different food, but probably other amenities you took for granted may be missing replaced by ones you never knew you needed. Also, you may find that many of your electrical appliances will not work with the new power source. Unless you really understood the new country and planned carefully you may not be pleased with the results.

The same multiplication of complexities exists in the case of your company. You have a business plan and have assumed that the building and facilities to support it will meet requirements and characteristics. Now those details must be defined to the level needed to engage Architectural Design and Construction Companies. This must be done taking into account where you are moving to in Asia, but now you can't take anything for granted. For example, do you know your total utilities requirements and are you sure the new site can supply them? Do you know the reliability of your electrical supply or do you now need to supply backup power? How do your new employees get to work? Do they arrive by bus from a dorm you provide? (Oh, you didn't include the dorm?) Do they ride bicycles and need bike racks? When guests arrive do they have drivers because they can't rent autos - so you need to provide a drivers room? How do you take into account differences in environmental and safety requirements? Are you in a typhoon or a seismic zone?

To understand how to fully detail the requirements, and have a successful interaction with the design and construction team, EWA can help you explore four general categories:

1. Space Requirements – How does everything fit in?
2. Facilities Requirements –What needs to be supplied to support the entire facility?
3. Site works Requirements – What goes on outside the building?
4. Utilities Requirements –What gets supplied to each tool or specific building area?

It should also be noted that the site selection team will need a subset of these requirements to know what to look for. As in the house-hunting analogy, the broker can find a lot of houses that are close to meeting the requirements and might be great bargains for which the purchaser will make compromises or be willing to do upgrades. Move a wall, put in a new kitchen, add air conditioning - all possible but they will affect final cost and timing. The site selection process is the subject of another EWA white paper in this series. It includes the building requirements and many items not directly related to the facility itself that portray the “neighborhood” and needed support services.

## **1. Space Requirements:**

Here we assess the total space required and the particular characteristics. First and foremost we consider the equipment footprint and placement, and how much space is needed around each tool for employees to do their work, parts stocking, maintenance, and aisles for hand trucks or forklifts. Standards for aisle space may vary depending on the country, and automation decisions may effect the total employee population needing to be accommodated. Once the equipment layout is specified, architectural requirements must be addressed. Figure 1 shows some of the possible considerations. These requirements will depend on many factors - some simply based on the current operations, and some on the contemplated new processes and equipment set. Local country conditions may also play a role. All these issues can be dealt with as long as the right questions are asked and the answers understood.

**Figure 1**  
**Architectural and Special Space Requirements Examples**

- **Floor live load and equipment weight**
- **Raised floor requirements**
- **Floor vibration requirements**
- **Interior finish / floor finish**
- **Ceiling heights**
- **Clean room requirements**
- **Temperature and Humidity control**
- **Lighting**
- **Floor drains and chemical containment**

Besides the manufacturing floor, there will be requirements for space that supports the manufacturing operations and personnel, as shown in Figure 2. The manufacturing operations support may be similar to what exists today but offer opportunity for consolidation and upgrade. Work done offline today may be better-done “line side”, or tucked away operations may be better situated with “like” operations. Storage requirements may depend on the local environment, including such diverse drivers as security for expensive material or parts, to local weather conditions such as extended high-humidity. Storage area requirements for humidity sensitive materials will be quite different in Singapore than St. Paul. Personnel considerations must include not only office space for the professional staff but could also include requirements for a medical

room, change room, cafeteria and visitors' space. Space for many different uses needs to be assessed and understood. A well documented process will guide you through a detailed list that allows careful consideration and discussion of the tradeoffs and potential solutions. Space problems are not easily fixed and can cause costly delays, so careful review of requirements and consideration of future needs is vitally important.

**Figure 2**  
**Support Space Example**

**Manufacturing**

- **Computer, data, PABX room**
- **In-Process Storage – including special storage requirements**
- **Special rooms, secured for sensitive/precious items**
- **Maintenance space (tool shop, vendor space)**
- **Laboratory (dry, chemical, electrical)**
- **Materials stock/ truck door**
- **Finished product stock / truck door**
- **Garment change/ locker room / break room**

**Office / Personnel Space**

- **Offices – employees, contractors, guests**
- **Open space**
- **Cafeteria and break areas – and equipment**
- **Health and safety related**
- **IT room**
- **Lobby – visitors**
- **Lobby- production employees**
- **Conference rooms**
- **Office supplies (fax, copy, print)**

**2. Facilities Requirements:**

Once the equipment related requirements are known and the support space requirements identified, a total facilities requirement must be calculated for both average and peak demand. Figure 3 shows examples of these requirements. This includes such items as:

- ✓ The total facility electrical demand and need for general or specific backup systems
- ✓ Requirements for supply of heating and cooling for the environment and tools
- ✓ Chemical and water supply and storage including protecting the supply from interrupts and having waste-holding prior to processing for emergency situations.

All of these requirements will depend on the reliability of the incoming supplies, which is a local consideration. As an example, how often is electrical power lost, and depending on frequency, what is the impact to operations? Do critical operations need a generator or battery backup? Do chemical tanks need backup exhaust and waste-holding sumps? Other choices can range from central distribution of chemicals or delivery by drum, cylinder, or a mix. Each facility choice and backup has an associated cost. It is important to make the right decisions in light of your business plan and your unique process requirements, while taking into account the site selected.

**Figure 3**  
**Facilities requirements**

- **Central Utilities – Electrical, compressed air, water, cooling etc.**
- **Waste treatment**
- **Chemical Distribution and storage – central or local**
- **Gas distribution and supply – central or local**
- **Waste materials and solvents**

### **3. Site works :**

Site works are all the facilities (Figure 4) that exist outside the building. Many of these are very familiar anywhere in the world. Examples are: landscaping, drainage, facility access control and security. Some, however, will be unique to the country and city where the new facility will be located. The size of the parking lot, the need for a bicycle parking area, or the need for a bus drop-off area will be dependent on the number and how the employees get to work. If motor scooter is the main method, as in Vietnam, this needs to be considered.

The extent of required security is the other key element. This will depend both on where the factory is located and the value of the product and raw materials.

**Figure 4**  
**Site Works**

- **Parking Lot**
- **Fence / Gate**
- **Landscaping**
- **Drainage**
- **Drop off (Bus, Visitors)**
- **Security system**

### **4. Utilities Requirements :**

Finally, we get to the details of what exactly each tool requires in the way of utilities. A detailed listing is needed, by tool, for everything that goes into the tool and out of the tool. Examples include: whether bulk or tanked gases are used, DI water usage, chemical distribution either by bulk distribution or local container, process water use, cooling and heating needs (such as steam or chilled water). Likewise, gas exhausts and liquid waste streams by category and vacuum requirements must be specified. Others such as air handling for clean rooms or hoods, temperature and humidity requirements, electrical requirements (service voltage and load), backup requirements, and lighting are additional examples. Finally facilities monitoring and protection systems must be designated along with the required emergency and supply interruption strategy.

IT and PBX requirements are also very important items to consider. Example are where and how many network lines are required, coverage for wireless, and voice requirements.

**Figure 5**  
**Utilities Requirements**

**Utilities required by each process tool**

- Exhaust – specific to tool
- Plumbing – Bulk gas, DI water, chemical distribution, process water, cooling, steam
- Waste water
- Solvent waste
- Vacuum – process, janitorial,

**Facility specifications**

- Air conditioning vs. load
- Clean room
- DI water
- Gases
- Chemicals
- Compressed Air
- Service voltage / incoming voltage
- Distribution (redundancy requirements)
- Lighting
- Electrical back-up (exhaust, critical tools)
- Emergency generator
- Emergency lighting
- Facilities monitoring
- Telephone system
- Security system
- Fire protection system
- LAN cabling

**Summary**

In summary the facility in Asia may be new construction or retrofit of an existing structure. In either case the design and fit up activities must follow a carefully formulated set of requirements that meet both the needs of the manufacturing operations and the staff. This design must also take into account the cultural and physical needs driven by the local realities of culture and geography.

Rich joined EWA in 2006 where he is currently 'Section Leader, Manufacturing Operations, Product Development and Delivery'. Dr Levine retired from IBM after more than 35 years of service involving high technology manufacturing operations. Dr Levine has held numerous management positions in all facets of high technology manufacturing and support. He has been personally involved in plant start-ups / product transfers to manufacturing facilities in Canada, France, Germany, Japan, Singapore and China. Dr Levine has been called upon to lead various task force activities on manufacturing operations and quality improvement. He holds a PhD in Ceramic Technology from Rutgers University. Dr Levine and his wife, Sue, are the parents of 4 children and are proud grandparents of 4. They make their home in Poughkeepsie, NY.

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**Fig. 6**  
**EWA's Critical Planning Factors**

1. Financial Plan
2. Project Confidentiality
3. Site Selection
4. Human Resources
5. Expatriate Policies
6. Board of Directors Operations (JV entities only)
7. Partner & Government Relations
8. Business Formation
9. Intellectual Property (IP) Protection
10. Physical Security
11. Information Technology (IT) & Integration with Parent Company
12. Disaster Planning
13. Sales & Marketing
14. Environmental, Health and Safety
15. Supply Chain
16. Customer Fulfillment Process
17. Manufacturing Operations
18. Quality
19. Facility
20. Country Infrastructure
21. Project Management Process
22. In-Country Business Support