

## INTERNATIONAL INSPECTION FACILITIES: PLANNING RATIONALE AND EFFECTS ON TERMINAL DESIGN

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The number of U.S. international gateway airports has been growing rapidly. According to the Immigration and Naturalization Service (INS), there are over 100 U.S. airports designated as ports of entry. Many of these airports are not fully staffed. Others are general aviation airports along the Mexican or Canadian border which do not involve the types of major projects which will be discussed in this presentation.

However, issues such as open skies agreements (like the United States has negotiated with the Netherlands), more liberal bilateral air service agreements (like the new German bilateral), the potential of NAFTA, and route reallocations are resulting in more airports receiving scheduled international service. This means that facilities for international passengers will be needed at more airports.

Federal Inspection Services (FIS) facilities have major impacts on the design of terminals. For example, the recent establishment of a route between London and Nashville, will result in expanding the FIS program at Nashville from handling charters to processing scheduled flights on a daily basis.

The FIS facility can control and shape the entire footprint of the terminal building. Moreover, as inspection procedures change such as they have a number of times over the past 15 years, the cost of facilities increases and airport terminal construction projects are delayed.

The purpose of this presentation is to review some of these changes and how they have affected the design of FIS facilities. In addition to current procedures, examples will be given of past changes in inspection procedures that have caused FIS facilities to become outmoded or inefficient.

### FIS PROCESSING CAPACITY

The size and configuration of an FIS facility are related to its capacity. Airport operators and the FIS agencies refer to capacity in terms of the number of passengers that can be processed per hour. There are many ways of determining capacity. What is the rated capacity? How is it measured? What are the peaking factors within the design hour? For example, a facility with a capacity of 800 passengers per hour could handle two

B747s arriving at the same time, or 30 minutes apart, or 55 minutes apart. Each is the equivalent of 800 passengers per hour. It could also be equal to three DC-10s, 20 minutes apart, or any number of other combinations that result in 800 passengers being processed through the facility in the space of an hour.

The FIS agencies base their staffing and facility requirements on steady-state flow. However, facility planners and airport operators must also consider the various peaks and local characteristics. The FIS Guidelines, however have a caveat to cover this, which has appeared in every edition:

*"This ratio can only be achieved under optimum conditions. Factors such as baggage delays, origin of flight, passenger mix, etc. are key determinants which could possibly mitigate against achieving these figures. These issues must be considered during early planning stages."*

The ratio referred to above is the number of passengers per hour, a figure which has been changed periodically. The main determinant of capacity has usually been the Immigration and Naturalization Service (INS) inspection procedures. (Table 1)

In 1979, the FIS agencies established a procedure called "One-Stop", which had a major effect on terminal design. The concept was to have all passengers inspected at a combined INS and Customs Service (USCS) area after claiming baggage. The agencies rated the capacity of a double counter with two inspectors at 100 passengers per hour. This system quickly disappeared (almost before it was implemented) for a

TABLE 1 RATED CAPACITY OF ONE INS DOUBLE COUNTER (2 INSPECTORS)

1979	One-Stop	100 pax/hr
1980s	U.S. Citizen-Bypass	(varies)
1990	U.S. Citizen-Bypass	114-117 pax/hr
1993	100% INS Inspection	100 pax/hr

number of reasons, mostly related to the need to cross-train INS and USCS personnel.

The 1980s another system, generally referred to as U.S. citizen bypass, was tried. Under this procedure passengers carrying U.S. passports flashed their passports at the INS counter, kept walking, picked up their bags, and went to the USCS counter where inspectors took a closer look at the passport in the course of the customs inspection. Foreign passengers, green card holders, and others went into the INS counter and were inspected.

However, the FIS agencies never changed the guidelines published in 1979. Facility planners still had to follow the guidelines for a one-stop system even though the FIS agencies were using a different procedure. This caused a certain degree of confusion in terms of both physical layout and the processing rate to be used. The effective INS processing rate was increased, due to the bypass, but not formally codified. The effect on the physical layout was to reduce the queuing at INS, but to increase the queuing for customs inspection.

In 1990, new guidelines were published. Citizen bypass of INS inspection was retained, but new USCS procedures, referred to as "The Strategy of the 1990s" were instituted. The INS processing ratio was set at approximately 114 to 117 passengers per hour per double counter, but the basic inspection procedure, a variation of U.S. citizen bypass as set forth in the 1979 one-stop guidelines, was unchanged. The rationale was that automation was going to make it even better in the future. This did not happen. In the 1980s, when the designer of a new FIS facility talked to the INS personnel in Washington who approved such facilities, the guideline was still "use 100 passengers per hour, per double INS counter."

The FIS agencies are in the process of revising the guidelines and their procedures yet again. There is a draft circulating among the agencies and, as of September 1993, INS was back to using 100 passengers per hour, based on INS inspection of all passengers, including U.S. citizens. In effect, INS procedures have come full circle back to the 1979 processing rates.

If an airport had a 2,000-passenger-per-hour FIS designed in 1990 and implemented according to the then current guidelines, it would have had 17 pairs of INS counters. Today, however, if INS was to use its new guidelines, the facility would have a capacity of only 1,700 passengers per hour — theoretically a 15-percent loss of capacity. On the other hand, there may not be a practical difference since INS probably will not staffed more than half of the booths. It is also comforting to note that the draft guidelines do not supersede plans approved prior to publication or require retroactive construction. There has always been a problem in the difference between what the FIS agencies require of a facility in comparison with the level at which they are

able to staff it. The continual changes in agency procedures have been a major uncertainty in FIS planning.

One issue generally avoided in the guidelines has been the goal for processing time. In other words, what does any given processing rate really mean to the arriving passenger? Previous presentations have discussed the goals of minimizing walking distances and waiting times, but the FIS agencies have not provided a clear statement of policy on how long it should take people to clear FIS.

Under the new procedures, all passengers are to go through immigration inspection. There are different lines for different types of passenger (U.S. citizens, Blue lanes, etc.) but everyone is to be inspected. There is now a reference to a 45-minute standard, but it is not clear how it is defined. It may mean either 45 minutes from getting off the plane or 45 minutes from the end of the INS queue to clear INS primary inspection. Either way, passengers will not yet have claimed their bags and passed through customs. They will have completed only the INS portion of entry inspections. If the passenger has a passport problem has to go to INS secondary inspection, clearance could take a long time.

Most people would be surprised to learn that 45 minutes is assigned to the immigration process. Some in Congress would like to see 30 minutes, but the FIS agencies have not as yet been able to staff facilities to attain the 45-minute standard. Most airports and their passengers would prefer a higher level of service.

The new guidelines do not supersede plans approved prior to the implementation of the regulations or require retroactive construction. That is the good news. The bad news is that this is not always what happens.

For example, the new international terminal at Atlanta was designed in 1991 with a rated capacity of 4,500 passengers per hour, potentially expandable to 6,000 passengers per hour. USCS did not submit floor plans for their support facilities and their requirements for counters to the design team until the summer of 1993 — two years after the design was accepted by the airport. The designers had to rearrange the customs inspection area because USCS changed their procedures. USCS also requested (i.e., required) special conveyors, which added \$2 million to the original budget. The lesson learned by Atlanta is that as procedures change so must plans, even approved plans.

## EFFECTS OF INSPECTION PROCEDURE CHANGES ON FIS PLANNING

Changes in inspection procedures have caused some interesting problems in terminal design.

In 1979 the inspection procedure was to become a one-stop system. INS and USCS were to be merged, and the agencies would cross-train their inspectors.

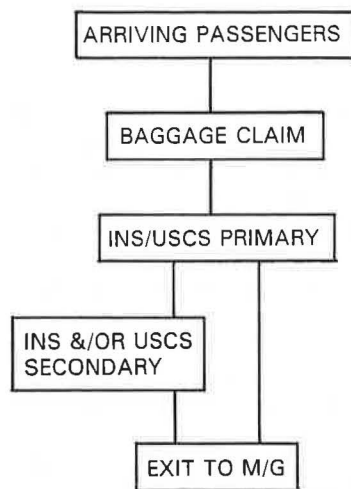


FIGURE 1 FIS procedures, 1979.

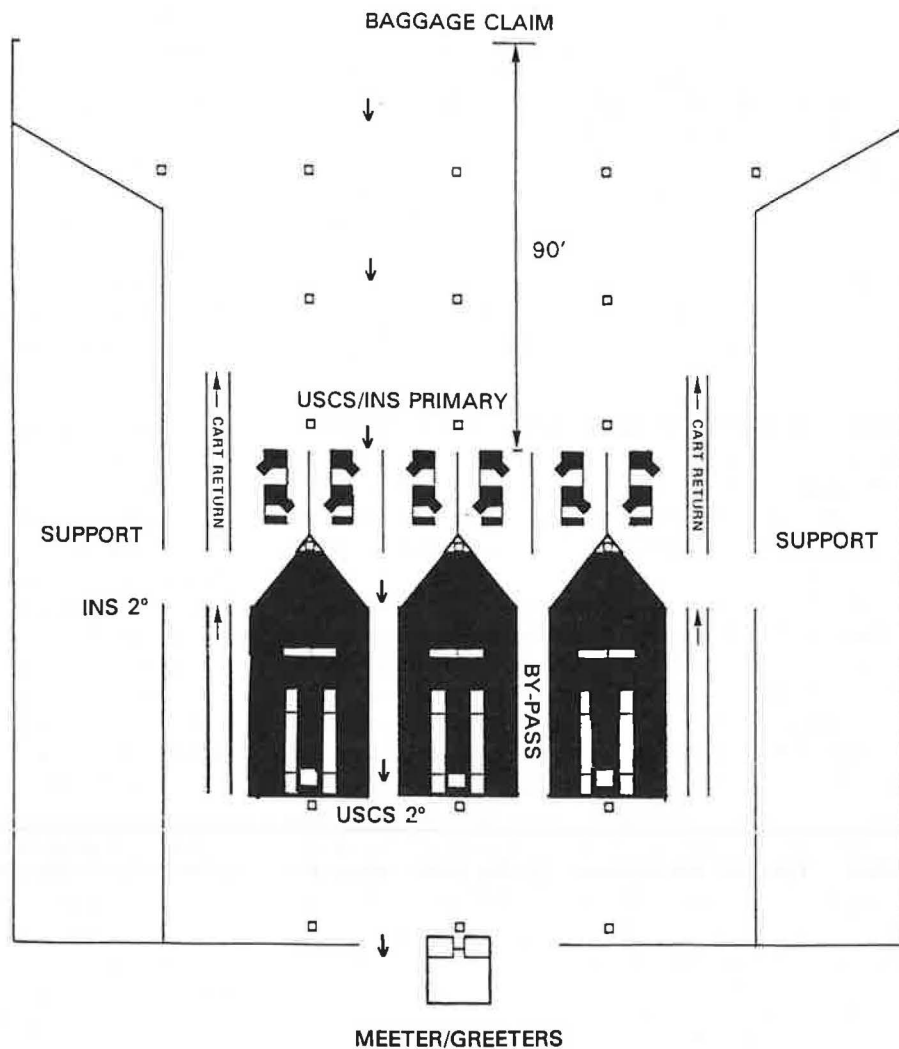


FIGURE 2 1979 one-stop module.

Passenger flow was to be as shown in Figures 1 and 2. Passengers would deplane, claim their baggage, then go through a 90-foot queuing area to a combined INS/USCS primary position. The small percentage of passengers with either immigration or customs problems were to go to the next inspection point for further questioning and/or to have their baggage inspected. It was expected that most passengers would bypass out to the meeter-greeter lobby. Parenthetically, examination by the Animal and Plant Health Inspection Service (APHIS) did not have the prominence in 1979 that it has today.

This procedure dictated a certain configuration for the FIS facility and the terminal building. FIS had one big queue, a relatively complex inspection area, and then

an exit. This was a radical change from the way it had been done prior to 1979, which was immigration first, then baggage claim, and finally customs. The one-stop strategy lasted about two years on paper.

The current procedure does not yet have an official name. USCS calls their system the Strategy of the 1990s; INS has not given their procedure a name. Figures 3 and 4 illustrate the published procedure (1990 edition), which appears conventional and very similar to the pre-1979 and de facto post-1981 passenger flow. Passengers deplaned and went to INS primary, where the majority of the passengers were inspected. The only passengers allowed to bypass INS were those on flights which had been pre-inspected at a foreign airport. Passengers having immigration problems went to the

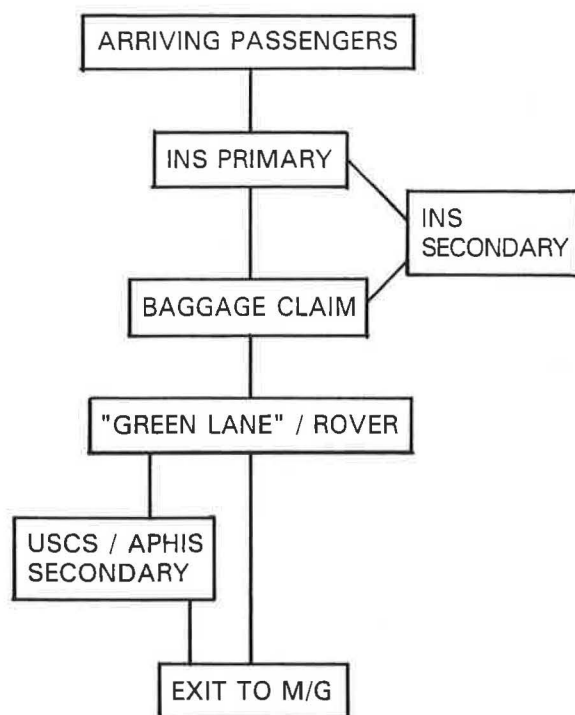


FIGURE 3 FIS procedure, 1990.

INS secondary area for further questioning. Passengers then claimed their bags and customs inspection took over.

The new inspection system involves using more roving inspectors, and pre-classifying passengers before they arrive in the United States using the Advance Passenger Information System (APIS). The APIS procedure begins when a passenger checks in at a foreign airport. Information about each passenger goes into the airline computer and is relayed back to INS and USCS and run against a series of federal and state data bases while the flight is in the air. From these data bases, the agencies come up with a small list of people who may be suspect. The concept is that passengers who have been screened through APIS go to the Blue Lanes at INS and are processed through much faster because the passenger manifest has already been reviewed.

Figure 4 is a simplified FIS layout from the 1990 FIS Guidelines based on the new Terminal Five at Chicago O'Hare Airport. Passengers enter immigration from the sterile corridor system at the back and sides, queue for immigration, and exit INS primary from both sides to the center. This forces passengers past INS secondary (the block in the center) so INS supervisors can be sure

that passengers who are supposed to go to secondary inspection do not get lost in the crowd at baggage claim.

The Rover Command Center (RCC) has a major role in the new USCS inspection system. When a passenger pre-selected by the APIS process for customs inspection gets to an INS booth, the inspector sees the name on the hot sheet and pushes a button. In the RCC a light goes on and the USCS rover supervisor knows there is a suspected passenger at that booth. The supervisor notifies one of the rovers. A glass wall separating immigration from customs allows the rovers to see who is coming out of immigration and to follow them through. A single level FIS facility is necessary for optimum use of the new system.

At baggage claim a passenger who has been previously identified by APIS screening will be intercepted by a rover and taken to a USCS secondary counter for inspection. Some rovers work the crowd making observations and intercepting passengers within the claim area. Profiling criteria are secret, and the rovers have many tricks of the trade. It is fascinating to watch a good rover team mix with the passengers and pull people out using this profiling system. APHIS also has roving inspectors, some using dogs trained to search for food and plant materials.

There are also high-risk flights where USCS wants to look at everyone from that flight. If there are a large number of high-risk flights at an airport, USCS may require a movable barrier system to segregate the baggage claim unit for the high-risk flight and funnel the passengers directly to a USCS secondary inspection area.

Most passengers, however, will go to the green lanes, also known as profiling stations. The profiling stations are staffed by USCS and APHIS inspectors who look at the customs declarations. On average, approximately 90 percent of the passengers will be directed out of the FIS without baggage examination. The remaining 10 percent would be directed to either the APHIS X-ray units on the right, or the customs counters on the left, depending on the type of illegal imports the inspectors think the passenger might have. APHIS runs baggage through an X-ray. They are primarily looking for food, and plant materials, but they can also spot other contraband.

Once passengers leave the inspection area, there is a recheck counter where transferring passengers can recheck their baggage for a connecting flight. In the example of Chicago O'Hare, there is a large percentage of transfers since both United and American have international flights. By having the recheck counters at a point before the meet-greeter lobby, connecting passengers can be freed of their bags before

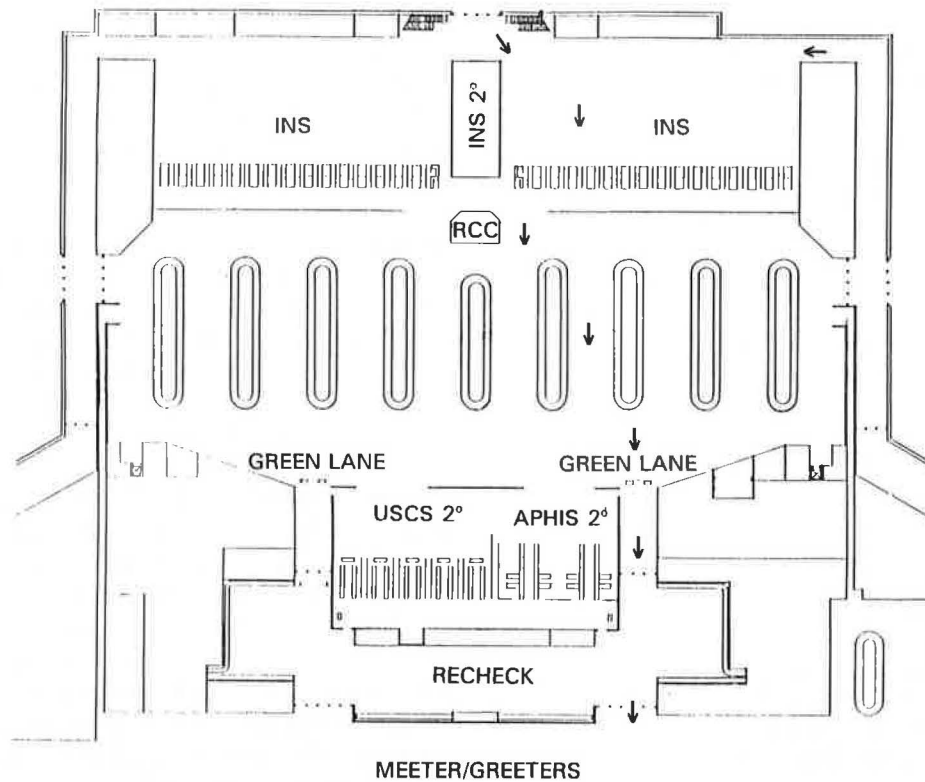


FIGURE 4 1990 typical FIS, O'Hare Terminal 5.

entering the crowds of the meeter-greeter lobby. It is also desirable to get connecting passengers out of the flow to the meeter-greeter lobby and back to the gates through a separate security check point. These passengers have no one meeting them, and the last thing they want is to push through a crowd.

In the Chicago example there is also an interesting point about the issue of capacity. When the international terminal was planned in 1988-1989, the capacity was estimated to be 3,500 to 4,800 passengers per hour. As built and opened in the summer of 1993, it had 34 double INS counters, which would be 3,400 passengers per hour under the current standards. (Figure 4 as taken from the FIS publication does not have the correct number of counters.) So far, the airport has not had enough experience to determine what is the effective capacity or the average passenger processing time.

## CASE STUDY

Flexibility is a concept emphasized in the planning and design of all terminal buildings. As FIS agencies have revised inspection procedures, changes have been required in the physical configuration of the FIS. There

have been some major changes, each of which was supposed to set a new standard. The lesson to be learned is that further changes in the future are inevitable, and new FIS facilities should be planned to have the flexibility to accommodate them.

One example of the need for flexibility is the Tom Bradley International Terminal at Los Angeles International Airport. The terminal, planned in 1981 to the 1979 one-stop standards, was to be opened in time for the 1984 Los Angeles Olympics. After final design and early construction process, the FIS agencies dropped the one-stop concept. This forced the designers to reconfigure the FIS, but the time pressure of the 1984 opening date limited the changes that could be made.

Figure 5 shows the original FIS layout of the terminal. This was a prototypical 1979 one-stop configuration. Passengers came in by way of sterile corridors or from a bus dock for remote aircraft stands (shown at the top of the diagram) and went to baggage claim. There was a very generous queuing space with ample room for primary and secondary inspection counters. The recheck counters and the meeter-greeter lobby are at the bottom of the diagram. Two baggage claim devices, one on either side of the lobby, were for domestic or precleared flights to get more flexibility out



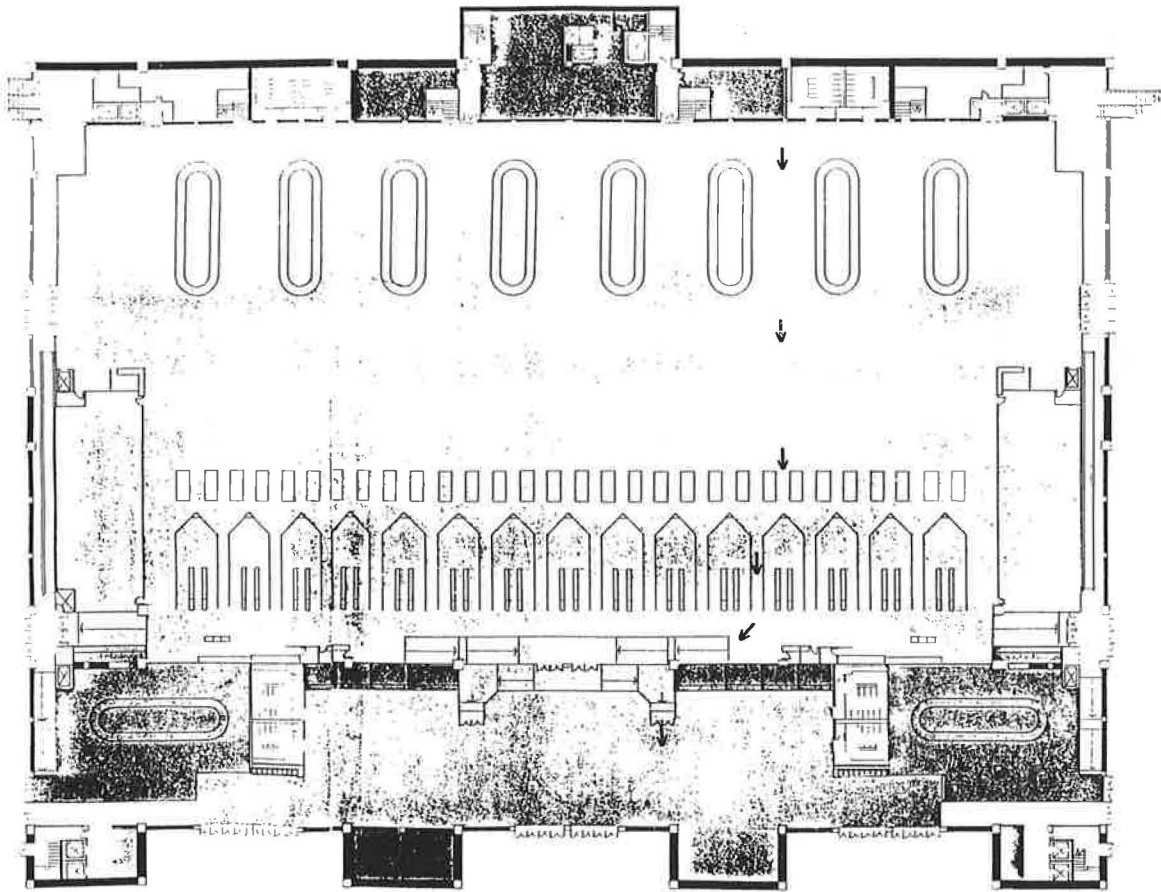


FIGURE 5 LAX Tom Bradley International Terminal, 1981 plan.

of the building. That is the way it was designed, and construction begun.

When the FIS agencies decided to abandon the one-stop concept, they went back to a conventional system. Because the terminal was scheduled for completion in time for the 1984 Olympics, the envelope of the building was already set and under construction. The baggage claim feeds from an interstitial baggage handling level above were already set. The claim units could be moved, but the amount of movement was limited. There was no room at an upper level for immigration inspection, and the designers had to fit a two-step process into a one-step design. The result was a very narrow queuing area for immigration. The immigration area had to be reconfigured and moved many times. Figure 6 is the current (1993) configuration. When the terminal first opened, the immigration counters had even less queuing, and it was like walking into a hallway. The worst conditions occurred when Asian flights arrived with high loads and a low ratio of U.S. citizens, resulting in a low amount of bypassing.

Most of the queuing was needed at immigration, but the baggage claim areas could not be moved further without totally disrupting the baggage make-up area as well. Baggage systems are the most critical system to design because bags do not go around corners very well. HVAC, plumbing and electrical systems can be rerouted with relative ease, but baggage conveyor systems are very difficult to change once they have been installed. Los Angeles International now has a very generous queue area for customs, but the new procedures minimize customs inspection resulting in a space imbalance.

The international terminal at Atlanta faced a similar situation. It was designed for one-stop, and then FIS procedures changed. The airport was able to find room for an INS processing area on another floor of the terminal, but the level of passenger service was greatly reduced from what was intended. As with Los Angeles International there is a surplus of queuing for customs, but queuing for immigration is less than desirable. A new international terminal will eliminate these problems.

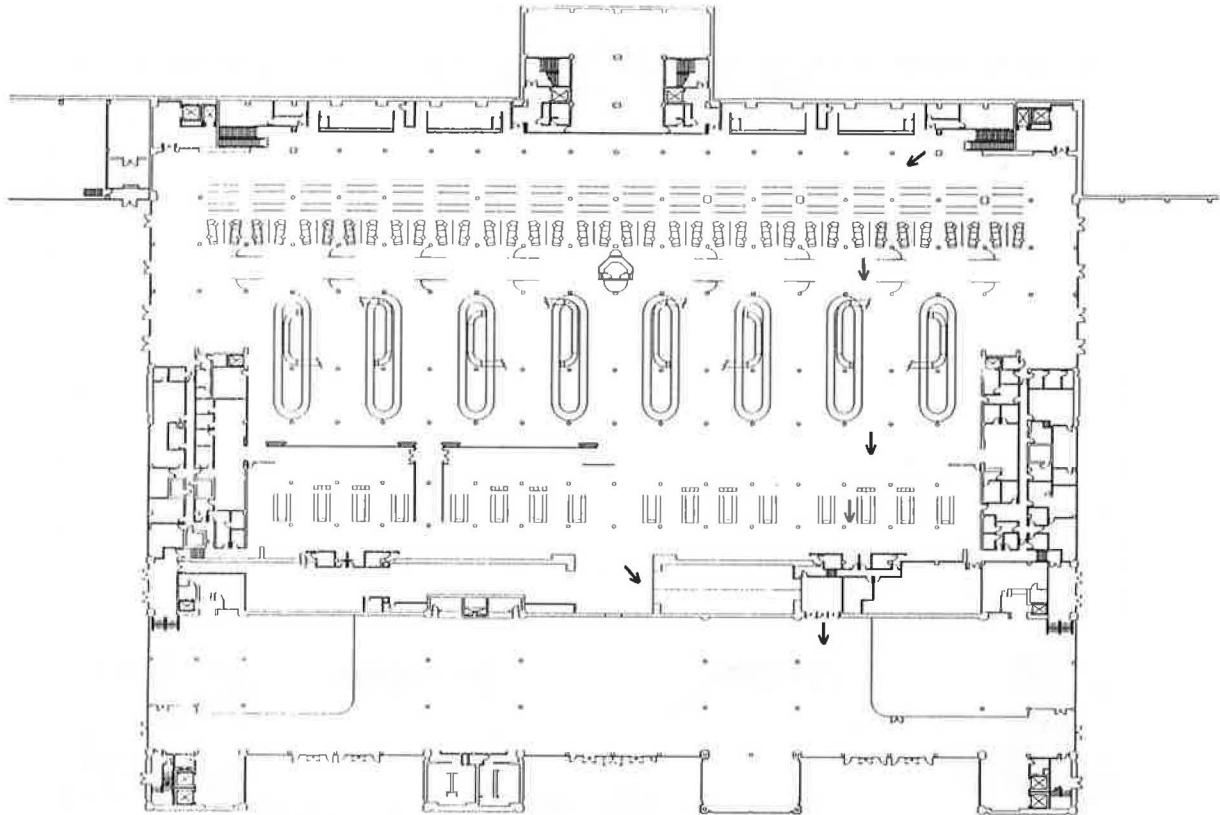


FIGURE 6 LAX Tom Bradley International Terminal, 1993 configuration.

## DESIGN ISSUES

The previous examples were selected to make a point. FIS agencies have changed procedures in the past. Each time they change, it generally requires more space. The design of FIS processing areas should be as flexible as possible to accommodate these changes.

This can make a terminal planner a bit cynical. However, one must plan the facility for the procedures that the agencies say will be used and try to provide as much flexibility as physically and financially possible. The amount of space, and the dimensions of an FIS facility can be substantial. Figure 7 represents the typical dimensions and inspection sequence of a one-level FIS facility designed to the current guidelines. It provides the desired straight, flow-through facility that the agencies and passengers prefer. Passenger orientation is best in such a facility because the various inspection steps are more readily apparent, and passengers can see where they are going.

The queuing space for INS and USCS/APHIS recommended under current guidelines, is at least 70, but preferably 90 to 100 feet. The INS inspection booths are 15 feet long, with 10 feet of cross-circulation behind them. This layout assumes the INS secondary inspection

is to the side rather than in front of the primary counters as in most older facilities. By placing the INS offices to the side and dividing the INS inspection area from the baggage claim by a glass wall, the USCS rover function is enhanced.

Next is a circulation space with room for bag carts and the rover command center, typical sloped-bed baggage claim units with 200 to 220 feet of claim frontage; queue space for USCS and APHIS inspection, cross-circulation to one exit (or two in a very large facility), and some USCS/APHIS support space.

The overall length is 350 to 420 feet for a straight-through FIS facility. If the baggage recheck area and meeter-greeter lobby are also in line, the total length can expand to well over 500 feet for a large terminal. Most airports would have a difficult time accommodating this much space on a single level. It is interesting to note that at Chicago O'Hare the new terminal has only 65 feet for INS queuing. There is usually a limit to the space which can be wedged into a building, even a brand new one, when there are site constraints.

One design feature stressed in this example is the single-level facility. The agencies prefer a single level because of the rover system and the visual contact that

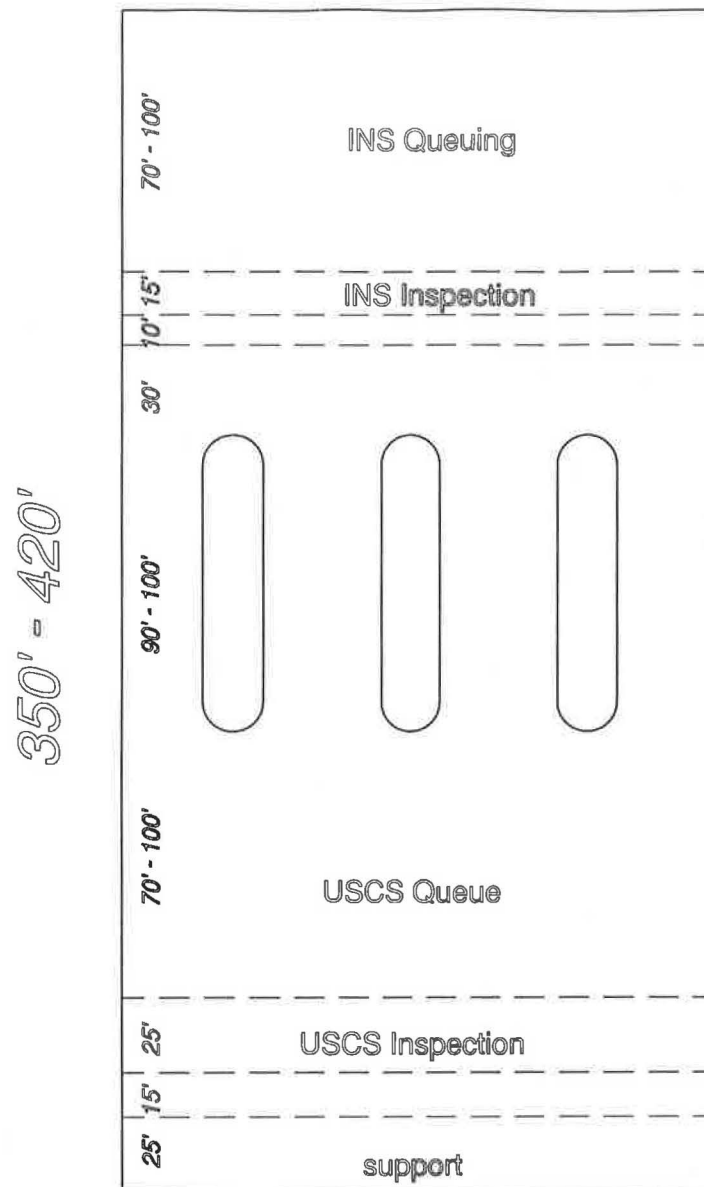


FIGURE 7 Typical dimensions.

is an integral part of the procedure. If an airport cannot provide a single-level FIS due to site and building constraints, the agencies will not refuse to staff the facility, but they may require a second rover command center in the INS area so that USCS supervisors can still see the INS counters. If the APIS screening has identified a suspect passenger, the supervisor can radio a description (such as "the man coming out of booth 14 is wearing a red Hawaiian shirt and carrying a straw bag") and the rovers in the baggage claim area can easily pick this person as he comes down the escalator.

There is another, more well known, issue — the glass wall. The official position for many years has been that

the FIS area must have a physical and visual barrier separating it from domestic passenger facilities. The idea is to prevent communication between passengers and other terminal occupants and to prevent observation of enforcement actions.

There have been many interpretations as to what is acceptable. On the upper level of the International Arrivals Building at Kennedy Airport in New York formerly had big glass walls that provided a view down into the customs area. The glass was painted over a long time ago. In contrast, the international terminal at San Francisco airport has a big glass well in the middle of the terminal. Visitors and enplaning passengers can



look down into the FIS area, but visibility is limited to the baggage claim area. Visitors cannot see the INS or USCS/APHIS counters. The angles are such that onlookers cannot observe the areas of real enforcement action, and viewing a rover interception is not considered to be a problem. Seattle/Tacoma has a similar observation area where visibility is limited.

While the FIS agencies in the United States require this type of barrier to prevent visual signalling between passengers and visitors, some other countries have taken the opposite tack. In Singapore, there is a glass wall between the FIS area and the meeter-greeter lobby, and most passengers bypass customs inspection. Customs rover agents (mostly in plain clothes) watch for interactions between passengers and visitors. By allowing such visual communication, the rovers can identify potential customs violators. They achieve a very good interdiction rate.

The issue of glass sterile corridors has had many interpretations depending on the region of the country and how the agencies wish to enforce the guideline. Miami International is a great example of bending (some would say complete flouting) the rules. The third level of Concourse D, where American Airlines has a large number of international operations, is a sterile corridor on one side for international arriving passengers. The other side is an express outbound corridor with moving walkways going in both ways. A clear glass wall runs the entire length of the concourse. Domestic passengers can sit and wave to passengers coming in. The in-transit lounge is also visible.

In contrast, the new international satellite at Orlando has a high-tech, electronically controlled glass separating the holding rooms from the deplaning vestibules. This allows light into the hold rooms and maintains a view, but the glass can be made opaque electronically with the flip a switch. On the other hand, Terminal Five for Delta at Los Angeles International, built at the same time as Orlando, has clear glass in the vestibules where deplaning passengers go up the escalators. There is no tinting, no glass block, no electronic glass. Clear glass was acceptable in Los Angeles but not in Orlando.

Where to locate restrooms has always been an interesting issue. The guidelines state that the restrooms must meet FIS security requirements and be located prior to the inspection area. The new draft requires that restrooms be placed prior to the INS counters and states absolutely that there shall be none between INS and the FIS exits.

Looking back at the illustration of the recently completed Chicago O'Hare terminal (Figure 5), the trapezoidal areas to either side of the Green Lanes are restrooms in the customs area. The prevailing concept

during the design of Chicago was that the agencies are only interested in keeping things from getting into the country. If passengers get cold feet and want to flush it, that's fine. Apparently the thinking has changed again. There are interesting signs over the trash cans in the San Francisco baggage claim area, which can be seen from upstairs. They read: "Declare it, drop it, or pay a fine." The agencies are still trying to give passengers have a chance to get rid of contraband, but now they just want it thrown in the trash can (perhaps so they can check it out later).

Another issue is the growing space requirements for FIS agency support areas. There are areas for certain functions, such as secondary inspection, that must be adjacent to the processing floor. These space requirements have been generally stable through the procedural changes, but the area required for support facilities has increased substantially.

For example, in the 1979 Guidelines a facility to process 2,000 passengers per hour (excluding employee lockers, restrooms, and the current requirements for an exercise room) required 12,200 square feet for support space. The 1990 guidelines called for up to 17,600 square feet, a 44-percent increase. The main reason was duplication of support facilities, training rooms, and other such space for INS, USCS, and APHIS. The draft currently in review require 19,620 square feet for a 2,000-passenger-per-hour facility. The 11 percent increase over 1990 is primarily for APHIS support.

## INSPECTION FACILITIES IN OTHER COUNTRIES

Most countries have some form of border control for entering airline passengers and typically use a two-step immigration and customs inspection process similar to that of the United States. Basic layouts and passenger flows are also similar to those of the United States. However, processing times vary significantly from country to country.

Within the European Community (EC) borders between member states are in the process of coming down. In January 1993, the EC was supposed to become a single entity without internal borders, but this has not yet been fully achieved. Passengers between EC states are no longer subject to customs controls, but border checks are not yet totally gone. These changes are requiring major alterations in the design of international terminals, especially those at major European gateway airports.

Prior to the integration of the EC, passengers from outside Europe (North America, for example) would clear immigration and customs at their final European

destination. An airport such as Amsterdam, which has a large percentage of transfer traffic, has a large in-transit area where passengers can move between flights, spend money on duty-free merchandise, and connect to their final destination without ever officially entering the Netherlands.

Under the new procedures, passengers who are transferring to a flight to another EC country will clear immigration, undergo customs inspection of hand baggage at the first point of entry to the EC, and then board a "domestic" flight to their destination along with other locally originating passengers. Passengers on a through flight from overseas to another EC country beyond the point of entry may remain on the aircraft and clear immigration at their destination. The final segment will still be considered a domestic flight. When such passengers reach their destination, they claim their checked baggage and clear customs. The domestic passengers who boarded at the stop-over airport have special bag tags that allow them to exit through the "blue lanes", while all others exit through lanes subject to customs inspection. This may strike an American or Canadian as a rather loose system, but represents the strategy of targeting higher risk flights and selective inspection that has been the European norm for many years.

On December 1, 1993, the nine Schengen States (Belgium, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Portugal and Spain) removed immigration controls at their common borders and put into effect a common visa for 120 other countries. In this case, the definition of common borders extends to airline flights between any Schengen States regardless whether they are contiguous. This reduction in immigration inspection is expected to be expanded to the other EC states, but the implementation timetable is still under discussion. A number of problems remain. For example, Denmark is in the EC but is also part of the Nordic Travel area which includes Sweden and Norway.

Thus, if Denmark drops border controls to the EC, it is effectively opening the EC borders to the nonmembers countries of Norway and Sweden. The UK has also been reluctant to drop border controls based on concerns about the movements of non-EC citizens within the EC (viz. terrorism).

The implications for airline terminals are significant due to the variations in how immigration controls are implemented. Customs baggage inspection appears to be working well, but this is probably due to the low rate of inspection prior to 1993. The major design problem will be with immigration at first point of entry. A major gateway such as Amsterdam has been built to handle large numbers of in-transit transfer passengers. Immigration facilities were sized for terminating passengers and located to direct these passengers to the landside. Under the new procedures, a large proportion of the transfer passengers will have to clear immigration at Amsterdam and then reboard "domestic" flights without mixing with non-EC passengers who are in transit. This will require new immigration facilities and the division of terminals into international and domestic zones. It has been estimated that it may take three to five years to convert the major European airports to the new system.

## CONCLUSION

A fundamental principal of all terminal planning is to provide for flexibility and expandability. This is often easier said than done. Baggage systems, in particular, are more difficult to reconfigure than most other terminal components. The FIS facility can be the largest component of an international terminal, and the size and configuration of the facility is dependent on many factors. The facility should be planned for expansion, but also for reconfiguration if and when FIS agencies change procedures.