

Appendix F

UNIT COST ASSUMPTIONS



Overview

The assumptions that were used to determine quantities and the resulting unit prices for categories listed in the Project Needs Summary Estimated Costs for each airport are described below. The categories are from the Minnesota Airport Project Priority Equation with the two letter codes representing the “Type Points (T)” from the equation. Unit prices for construction related items include average soft costs such as preliminary studies, environmental reviews, design, and construction administration.

CO – Construction

- **Apron (For Based Aircraft Per Square Yard)**

The following criteria were used to estimate the unit price for a concrete apron to serve large aircraft.

- No Removals
- Excavation Depth – 20” under the apron
- Typical Concrete Apron section:
 - 12” Granular Borrow
 - 8” P-209 Aggregate Base
 - 8” P-501 doweled Concrete
- Joint sealant
- Tie-downs

The resulting estimated unit price for a concrete apron for based aircraft is \$165 per square yard.

- **Transient Apron (Per Square Yard)**

The following criteria were used to estimate the unit price for a bituminous apron to serve transient small aircraft.

- No Removals
- Excavation Depth – 20” under the apron
- Typical Bituminous apron section:
 - 12” Granular Borrow
 - 8” P-209 Aggregate Base
 - 4” P-401 Bituminous

The resulting estimated unit price for a bituminous apron for transient aircraft is \$32 per square yard.

DV (Development Land)

This item is for land acquisition with costs obtained from CIPs.

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EX (Extension/Expansion)

For purposes of the SASP and in accordance with MnDOT's classification system, only the extension/expansion of taxiways are listed under the EX code.

- **Taxiway (Lengthening Per Square Yard)**

The width of existing taxiways will vary at different airports. Therefore, the unit price for taxiway lengthening was developed on a square yard basis, which allows the taxiway width to be taken into account when an estimated cost for lengthening of a taxiway is determined. The following criteria were used to determine the unit price per square yard.

- Saw cut existing end of bituminous taxiway
- Excavation Depth – 20" under the taxiway
- Typical section:
 - 12" Granular Borrow
 - 8" P-209 Aggregate Base
 - 4" P-401 Bituminous
- Seal joint between old and new bituminous

The resulting estimated unit price per square yard for lengthening a taxiway is \$32.

FF (Fuel Farm Development - Per Gallon)

Previous costs for fueling systems were used to develop an average estimated cost for new above ground fueling systems. The estimated unit cost includes the following criteria.

- Above ground tank
- Concrete containment below the tank
- Self-service pumping facility

The resulting estimated unit price for a new fueling facility was determined to be \$25/gallon.

IM (Improvements)

- **Runway, Taxiway, and Apron Maintenance**

The estimated costs for these were obtained from MnDOT for each airport.

- **Runway Extension/Expansion**

Lengthening and/or widening of a runway are two extension/expansion options for which estimated unit prices were determined.

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- **Runway Lengthening (Per Square Yard)**

The width of existing runways will vary at different airports. Therefore, the unit price for runway lengthening was developed on a square yard basis, which allows the runway width to be taken into account when an estimated cost for lengthening of a runway is determined. The following criteria were used to determine the unit price per square yard.

- Saw cut existing end of bituminous runway
- Excavation Depth – 20" under the runway
- Typical section:
 - 12" Granular Borrow
 - 8" P-209 Aggregate Base
 - 4" P-401 Bituminous
- Seal joint between old and new bituminous

The resulting estimated unit price per square yard for lengthening a runway is \$32.

- **Runway Widening (Per Square Yard)**

The length of existing runways varies. Therefore, the unit price for runway widening was developed on a square yard basis, which allows the runway length to be taken into account when an estimated cost for widening of a runway is determined. The following criteria were used to determine the unit price per square yard.

- Saw cut existing edge of bituminous runway
- Excavation Depth – 20" under the runway
- Typical section:
 - 12" Granular Borrow
 - 8" P-209 Aggregate Base
 - 4" P-401 Bituminous
- Seal joint between old and new bituminous

The resulting estimated unit price for widening of a runway is \$33 per square yard.

IN (Instrument Approach)

- **ILS (Instrument Landing System – Per Each)**

Costs for this item were obtained from CIPs and/or MnDOT.

- **FAA ILS Monitoring (Per Each)**

The following criteria were used for determining an estimated cost for an airport's ILS to be certified by the FAA as an alternate airport.

- Telephone hardline – 2,000 feet
- Cost per foot for telephone line - \$3

The resulting estimated unit price for each monitoring system is \$6,000.

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LI (Lighting)

- **Runway**

For the SASP, only runway lighting was identified as a need. The type of runway lighting will depend upon the type of runway. Following are estimated costs for the three types of runway lighting. In addition, it was assumed that all runway lights would be replaced for any runway being widened.

- **HIRLS (Per Light, Per 200 Feet)**

The following criteria were used in determining an estimated unit cost for HIRLS every 200' along the edge of a runway.

- One light every 200 feet on each side of the runway.
 - Estimated cost for one light is \$1,350
 - Estimated cost for wiring for one light is \$450

The resulting estimated unit price for HIRLS on both sides of a runway every 200 feet is \$3,600

- **MIRLS (Per Light, Per 200 Feet)**

The following criteria were used in determining an estimated unit cost for MIRLS every 200' along the edge of a runway.

- One light every 200 feet on each side of the runway.
 - Estimated cost for one light is \$650
 - Estimated cost for wiring for one light is \$450

The resulting estimated unit price for MIRLS on both sides of a runway every 200 feet is \$2,200

- **LIRLS (Per Light, Per 200 Feet)**

The following criteria were used in determining an estimated unit cost for LIRLS every 200' along the edge of a runway.

- One light every 200 feet on each side of the runway.
 - Estimated cost for one light is \$550
 - Estimated cost for wiring for one light is \$450

The resulting estimated unit price for LIRLS on both sides of a runway every 200 feet is \$2,000

- **Taxiway**

For the SASP, taxiway lighting was only identified as a need where a taxiway extension to an existing lighted taxiway was identified. For a taxiway extension, an estimated cost of \$4,000 per 1,000 feet of extension was used.

MA (Master Plan)

All planning related to airports has been included under this category with estimated costs identified below.

- **ALP (Airport Layout Plan)**

The estimated cost for preparing an ALP varies by the type of airport and is:

- Landing Strip - \$60,000
 - Intermediate - \$190,000
 - Key - \$320,000

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- **Master Plan**

The estimated cost for preparing a Master Plan varies by the type of airport and is:

- Landing Strip - \$45,000
- Intermediate - \$100,000
- Key - \$150,000

- **Other**

Estimated costs for the following additional planning related studies have been included under "Other" within the project needs cost summary.

MS (Miscellaneous)

- **Buildings**

Estimated costs were developed for the following two types of buildings based on the need of an airport.

- **Administration Building (Per Each)**

The following criteria were used to determine an estimated total cost for an administration building.

- Building - 30 foot x 40 foot including electrical, HVAC, parking, and utilities
- Total unit price including parking and utilities - \$130 per square foot

The resulting estimated total unit cost for an administration building is \$156,000.

- **Restrooms (Per Facility)**

The total estimated cost to provide a single room restroom facility is \$15,000.

- **Hangars**

A unit price was estimated for T-Hangars, Conventional Hangars, and Site Preparation. Additional considerations in developing SASP costs for hangars included the following assumptions:

- T-Hangars – The smallest T-Hangar that would be constructed would provide space for four single engine aircraft.
- If less than 4 aircraft require hangar space, a conventional hangar is assumed for each aircraft.
- It was recognized that aircraft vary in size and space needs within a hangar. For this reason, the average space for a single aircraft within a conventional hangar was assumed to be 1,000 SF.
- The term "Unit" is used in the hangar cost estimates to reflect the storage area of a single aircraft.

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- **T-Hangars (Per Unit)**

It was assumed that the smallest 4 unit T-Hangar would be a nested T-Hangar with an average dimension of 51' wide x 105' long (5,355 square feet). The unit price for an average four unit T-Hangar was developed based on the following assumptions.

- Electrical – Minimal overhead lighting and outlets throughout the building
- No heating or plumbing
- Building – Steel roof, steel siding, and wood framed with no windows
- Doors – Each unit within the T-Hangar has a single man door and an accordion type hangar door
- Site preparation including hangar floor and apron are not included in the unit price

The resulting estimated total cost for a four unit T-Hangar is \$182,000, which results in an estimated price of \$45,500 per unit (aircraft).

- **T-Hangar Site Preparation (Per Unit)**

Site preparation for a four unit T-Hangar was assumed to include the following items:

- Excavation depth – 18" over the entire footprint of the building and apron
- Typical section under building and exterior aprons:
 - 12" Granular Borrow
 - 8" Aggregate Base
 - 6" Concrete
- Apron – Four 20' wide aprons extending out a distance of 20 feet.

The resulting estimated total cost for site preparation for a four unit T-Hangar is \$90,000, which results in an estimated price of \$22,500 per unit (aircraft).

- **Conventional Hangars (Per Unit)**

The average dimension for a Conventional Hangar was assumed to be 100' wide x 100' long (10,000 square feet). The unit price for an average Convention Hangar was developed based on the following assumptions.

- Electrical – Full building service and wiring throughout the building
- Heating, plumbing, and AC included
- Water and sanitary services included
- Interior office room
- Building – Steel roof, steel siding, large span structural steel framing, and insulated with four windows.
- Doors – Two man doors and accordion type hangar door
- Site preparation including hangar floor and apron are not included in the unit price

The resulting estimated total cost for a Conventional Hangar is \$950,000, which results in an estimated price of \$95,000 per 1,000 SF of space for one unit (aircraft).

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- Conventional Hangar Site Preparation (Per EA Unit and/or SF)

Site preparation for a four unit T-Hangar was assumed to include the following items:

- Excavation depth – 18" over the entire footprint of the building and apron
- Typical section under building and exterior aprons:
 - 12" Granular Borrow
 - 8" Aggregate Base
 - 6" Concrete
- Apron – Extends out 35 feet from the front, along 80% of the front side of the hangar.

The resulting estimated total cost for site preparation for a 10,000 SF Conventional Hangar is \$120,000, which results in an estimated price of \$12,000 per 1,000 SF of space for one unit (aircraft).

OB (Obstruction Removal)

It was assumed existing approaches that do not meet the SASP recommendations are restricted from being enhanced by obstructions. Based on this assumption, the following average estimated costs for removal of obstructions such as trees, buildings, and roads were used where an enhanced approach is recommended.

- Landing Strip and Intermediate Airports = \$100,000
- Key Airports = \$600,000.

If an airport had identified obstruction removal costs in their CIP, the CIP costs were used.

PA (Parking – Per Automobile)

Two separate unit prices were developed for this category. The first unit price is for the construction of a major parking lot, having curb and gutter and a full storm sewer system. The second is for the construction of a minor parking lot, having no curb and gutter and a minor storm sewer system. The following criteria were used to determine the unit prices for the two types of parking lots.

- Average space required for a car and associated drive lane is 300 square feet
- Removal of existing infrastructure on major lot and no removals on minor lot
- Excavation Depth – 18" under the parking lot
- Typical section:
 - 12" Granular Borrow
 - 8" P-209 Aggregate Base
 - 4" P-401 Bituminous
- Full storm sewer system for major lot and minimal storm sewer for minor lot
- Pavement striping
- Curb and gutter on major lot and none on minor lot
- Electrical and landscaping on major lot and none on minor lot

The resulting estimated unit price for a major automobile parking lot is \$3,450 per automobile and \$1,850 per automobile for a minor parking lot.

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SE (Security Improvements)

Only fencing of an airport has been included as a requirement and resulted in an estimated cost within the SASP.

- **Fencing (Per Each)**

The following criteria were used to determine an estimated cost for providing either a partial or total fence around an airport.

- Partial fence length - 2 miles
- Total fence length – 5 miles
- Fence height – 10 feet
- Pedestrian gates – 4 for partial fence and 8 for full fence
- Double swing gates – 4 for partial and 8 for full fence

The resulting estimated total cost for a partial fence is \$166,400 and \$412,000 for a full fence.

SZ (Safety Zone (RPZ))

Zoning is the only item identified within this category within the project priority equation.

- **Zoning Ordinance (Per Each)**

The estimated cost for developing a zoning ordinance varies by the type of airport and is:

- Landing Strip - \$3,000
- Intermediate and Key - \$15,000

VI (Visual Approach Aids)

Estimated costs were developed for the following visual approach NAVAIDS.

- **MALSR (Per Each)**

The total estimated unit price for a MALSR with a building on one end of a runway is \$550,000

- **PAPI (Per Each)**

The following criteria were used in estimating the cost of a 4 box PAPI for each runway end.

- 4 box PAPI
- 3,000 feet of wiring

The resulting estimated unit price for each runway end is \$43,500. This results in a total unit price of \$87,000 per each runway where a PAPI would be installed on each runway end.

- **REILS (Per Each)**

The total estimated unit price for a REIL on the end of a runway is \$12,000. This results in a total unit price of \$24,000 per runway where a REIL would be installed on each runway end.

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- **Rotating Beacon (Per Each)**

The following criteria were used in estimating the cost of a rotating beacon.

- Cost for beacon on tip down pole and installation with a 15' deep by 36" diameter concrete base - \$30,000
- Estimated cost for electrical conduit and wire to site - \$2,000

The resulting estimated total unit price is \$32,000 per each.

WX (Weather Reporting Equipment)

The following two items were identified for inclusion within the SASP under this category.

- **Automated Weather Observation Station (AWOS - Per Each)**

The total estimated total cost for installation of an AWOS is \$150,000.

- **Windsock (Per Each)**

The following criteria were used in estimating the cost of a lighted windsock.

- Windsock – FAA L-807, LED, internally illuminated, size 2, style 1
- Estimated cost for installed Windsock - \$7,000 for the unit and concrete base
- Estimated cost for electrical conduit and wire to site - 1,000 lf at \$4.50 per foot (\$4,500)

The resulting estimated total unit price for a Windsock is \$11,500 per each.

NW (New Key Airport)

Four airports were identified for total runway and taxiway construction/extensions that would result in a change to their designation from Intermediate to Key Airport. The following items were included under this estimated cost:

- ALP and Master Plan
- Parallel Taxiway
- Perimeter Road and Fence
- 10,000 Gallon Jet-A-Fuel Tank
- FBO Hangar
- Additional Hangar space for 10 aircraft
- Terminal Building

The above items resulted in a total estimated cost of \$6,210,000. Other costs associated with changing an airport's designation are included under Runway Extension/Expansion either in the airport's CIP or in the SASP mid-term costs.

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