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Feasibility Study of Expansion Options

Lionshead Parking Structure
Vail, CO

Prepared for:

Town of Vail
Dept. of Public Works/Transportation
1309 Elkhorn Drive
Vail, CO 81657

May 5, 2004

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May 5, 2004
JRH No. 1747.02

Mr. Greg Hall, P.E., Director
Dept. of Public Works / Transportation
Town of Vail
1309 Elkhorn Drive
Vail, CO 81657

RE: Lionshead Parking Structure
Feasibility Study of Expansion Options

Dear Mr. Hall,

The following report constitutes our team's feasibility study of several options for expansion of the Lionshead parking structure. The team consisted of J.R.Harris & Co., structural engineer; Architecture Matters, architect; and Burke Associates, mechanical/electrical engineer.

Executive Summary
Six options for different parking arrangements were investigated. Issues studied were ADA, structural, mechanical, electrical, fire protection, and the integration of new construction with the existing features. Sketches that illustrate the six options and cost estimates associated with each are attached. Three reports are attached: A structural report prepared by J.R. Harris& Co., a mechanical/electrical report prepared by Burke Associates, and a report on architectural concerns and ADA issues prepared by Architecture Matters.

Options
A total of six options were considered. They are summarized below:

- Option 1: A new conference center is built just east of the parking structure. A new access to the parking structure is provided by a bridge from the frontage road at or near the east end of the north side. The existing three levels of parking remain. The existing main stair at the SE will be removed to clear the new conference center. A new stair tower at the SE will replace it. A stair for exiting level 3 to the existing exit at the level 2 grade will be added at the NW corner. A sidewalk will be constructed with the new bridge to provide the same exit function from the NE corner of level 3. An elevator for ADA access will be provided, tentatively located in the atrium area between the two halves of the existing parking structure.

- Option 2: A new conference center is built just east of the parking structure. A new access to the parking structure is provided by a bridge from the frontage road at or near the east end of the north side. A forth level of parking is added to the parking structure. The existing SE stair will be removed and replaced with a stair tower as in Option 1. The exit stair at the NW will connect levels 4 and 3 to the existing exit at level 2 grade. A stair will be added for exiting from the NE corner of level 4 to the bridge sidewalk at level 3. The existing canopies over two ramps on level 3 will be removed and reused on level 4. An elevator for ADA access will be provided, tentatively located in the atrium area between the two halves of the existing parking structure.

- Option 3: The existing three levels of the parking structure are extended to the east. A new conference center is constructed over the parking structure. The parking structure entrance will be from level 1 at the east and the exit will be from level 1 at the west. The existing SE stair will be removed and replaced with a new stair tower as in Options 1 and 2. The existing SW stair could possibly remain, but a retaining wall would have to be constructed to permit the SW parking exit at level 1 grade. We suggest a second stair tower at the SW and removal of the existing SW stair as a more economical approach.. In order to permit bus access to the north side of the existing parking structure level 3, the area between the frontage road and the north side of the existing parking structure will need to be backfilled and paved. We propose a deck be constructed from the existing north wall to a new stem wall on a footing about 10 feet to the north. The backfill could then be placed against this wall and topped with pavement. The north wall of the parking extension would be constructed solid for its full-height, backfilled and topped with pavement, this for access to the service area of the new conference center. Ventilation air for the north side of levels 1 and 2 would come from each end to the horizontal "shaft" under the new deck at the north side. Air would be exhausted via new vent shafts located along the north wall. An elevator for ADA access will be provided, tentatively located in the atrium area between the two halves of the existing parking structure.

- Option 3a: Same as Option 3, and a three story residential building is built immediately south of the parking structure. The residential addition would have to be coordinated with the SE stair tower. The residential addition blocks air flow from the south, so a series of ventilation shafts will be needed for ventilation air along the south side.

- Option 4: A forth level of paring is added over the south half of the existing parking structure. The three levels on the north and four levels on the south are extended to the east. A new conference center is constructed over the parking structure. The issues are similar as those of Option 3.

- Option 4a: Same as Option 4, and a four story residential building is built immediately south of the parking structure. The issues are similar to those of Option 3a.

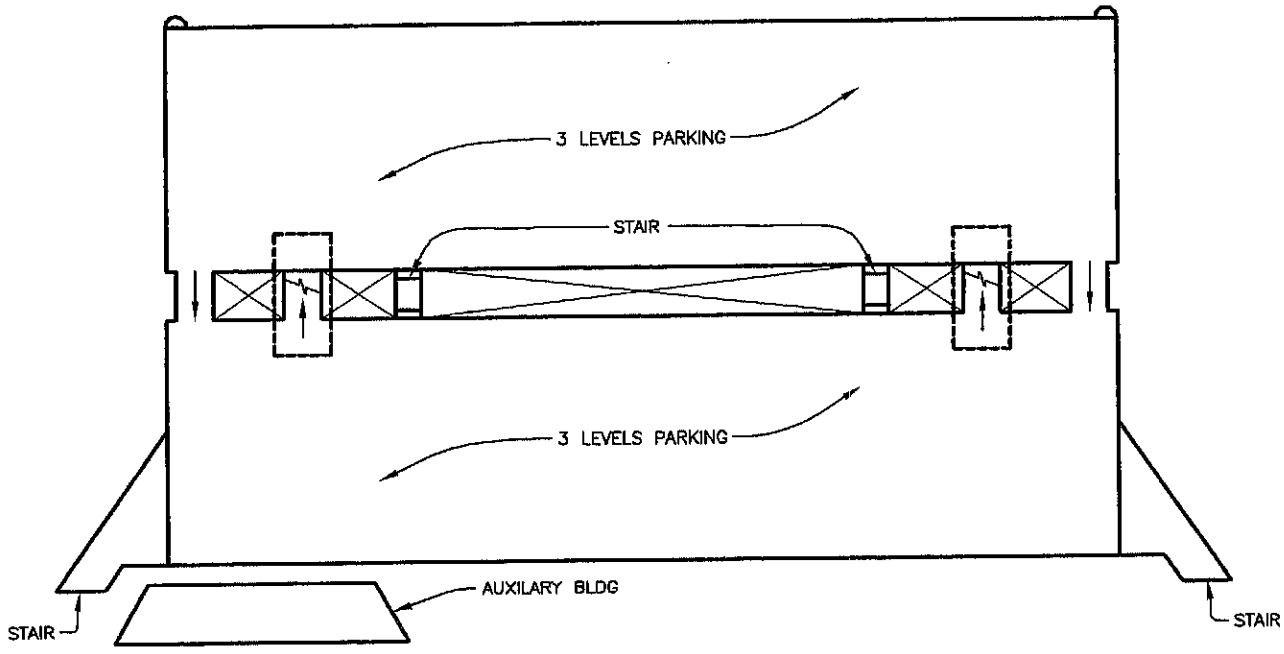
Detailed Reports
Please see the attachments for more detailed discussions of the issues.

Please contact us if you have any questions.

Very truly yours,
J.R. Harris & Company

Frederick R. Rutz, PE
Project Manager

Attachments:
1. Sketches
2. Cost Estimates
3. Report from J.R. Harris & Co.
4. Report from Architecture Matters
5. Report from Burke & Associates



EXISTING GENERAL ARRANGEMENT

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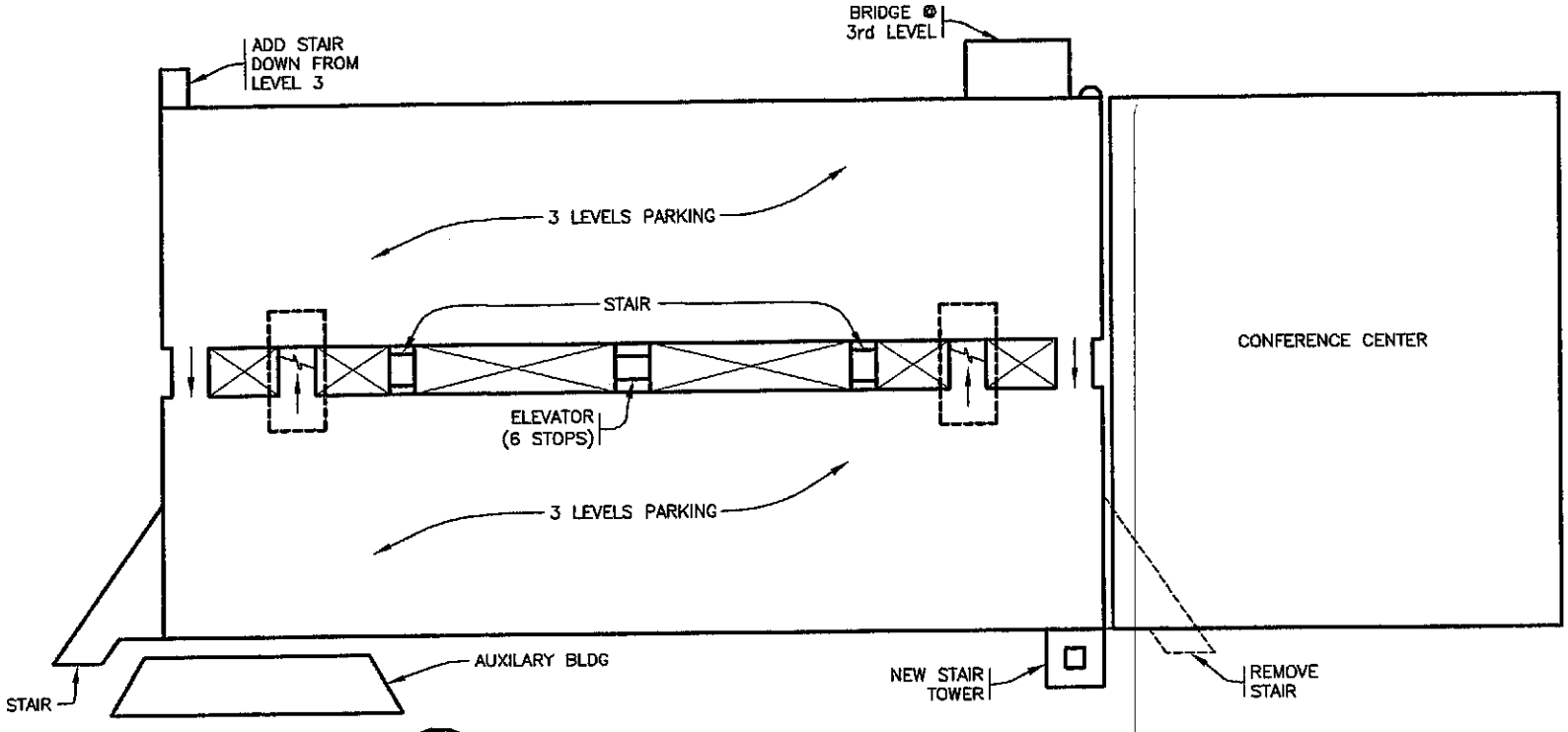

OPTION 1

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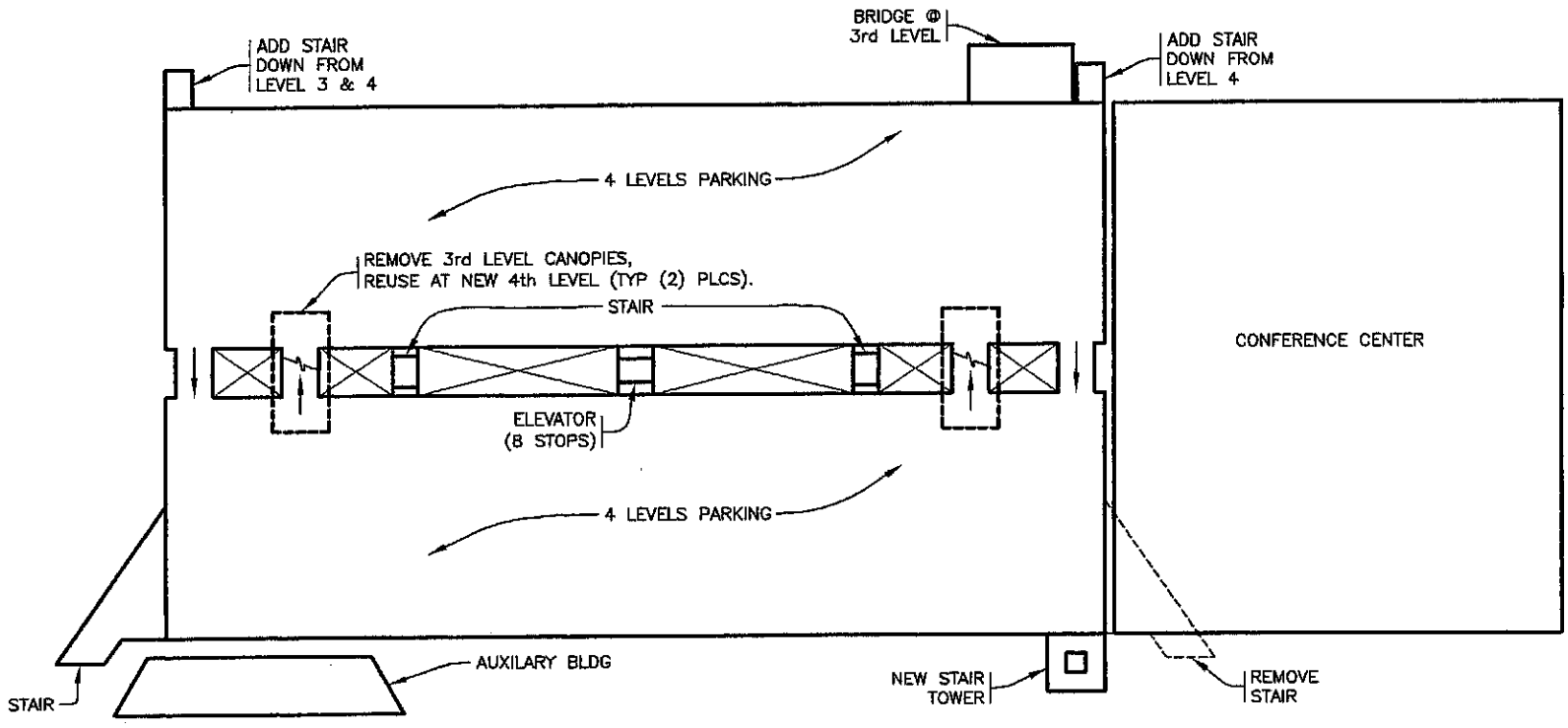

OPTION 2

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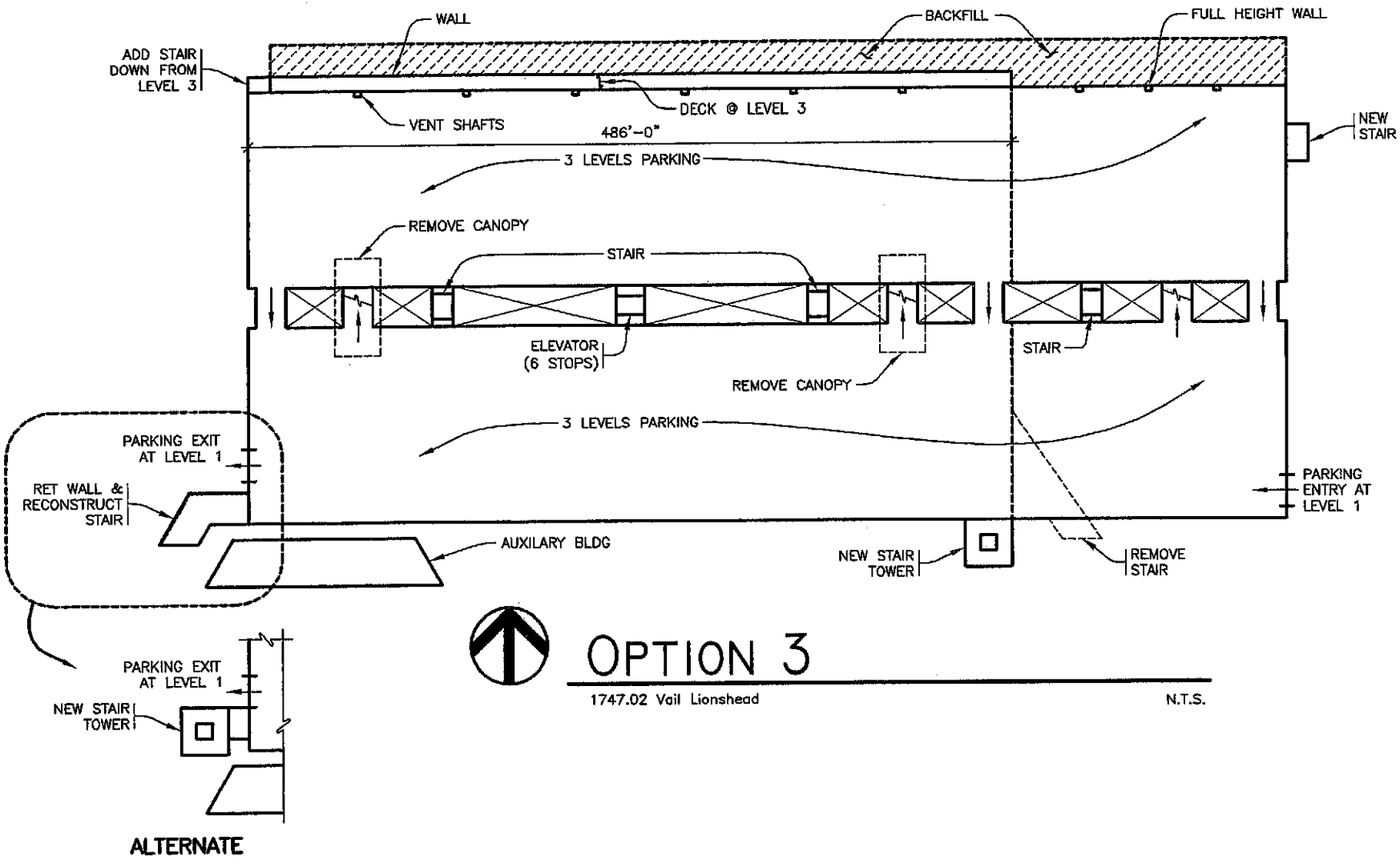

OPTION 3

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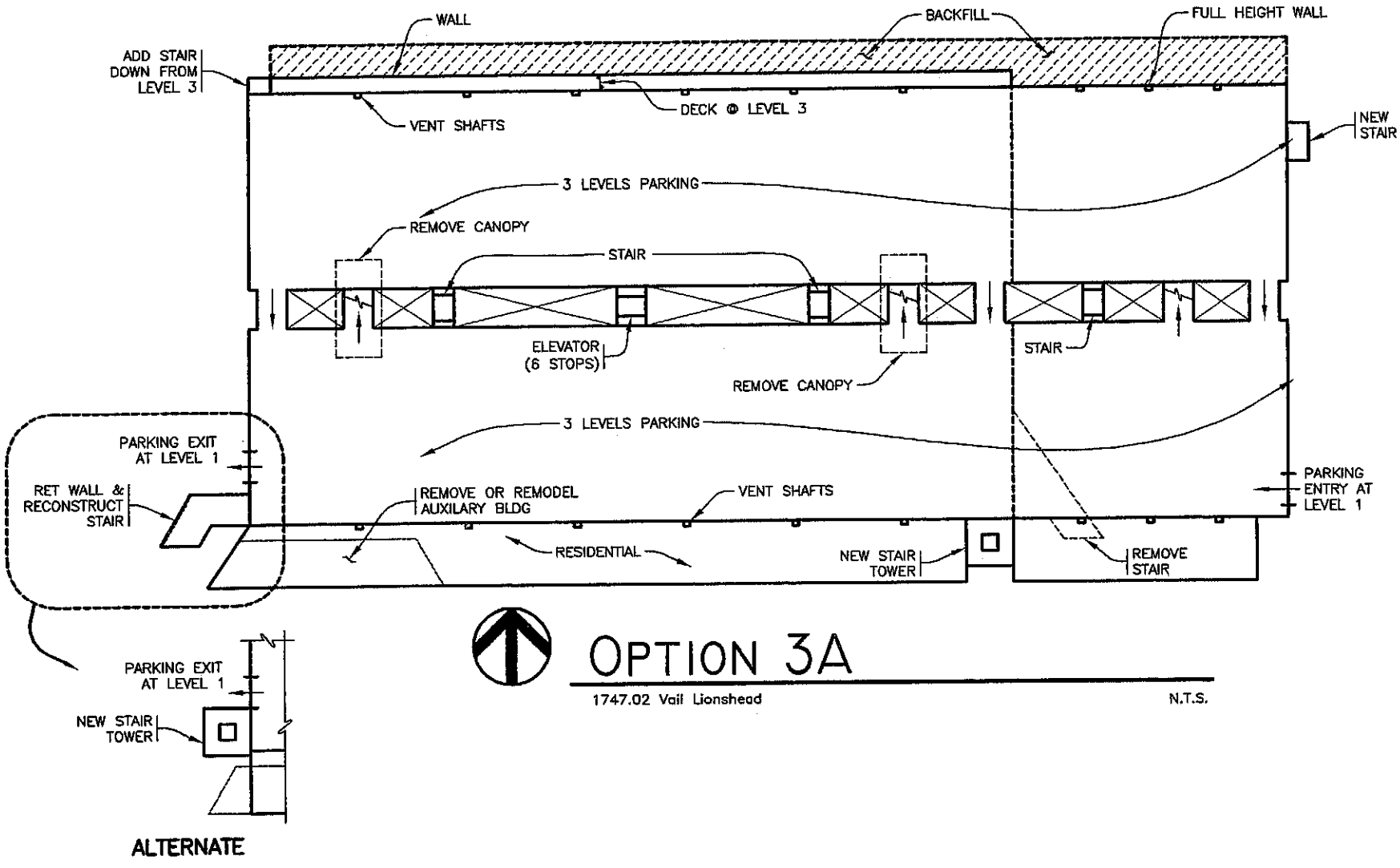

OPTION 3A

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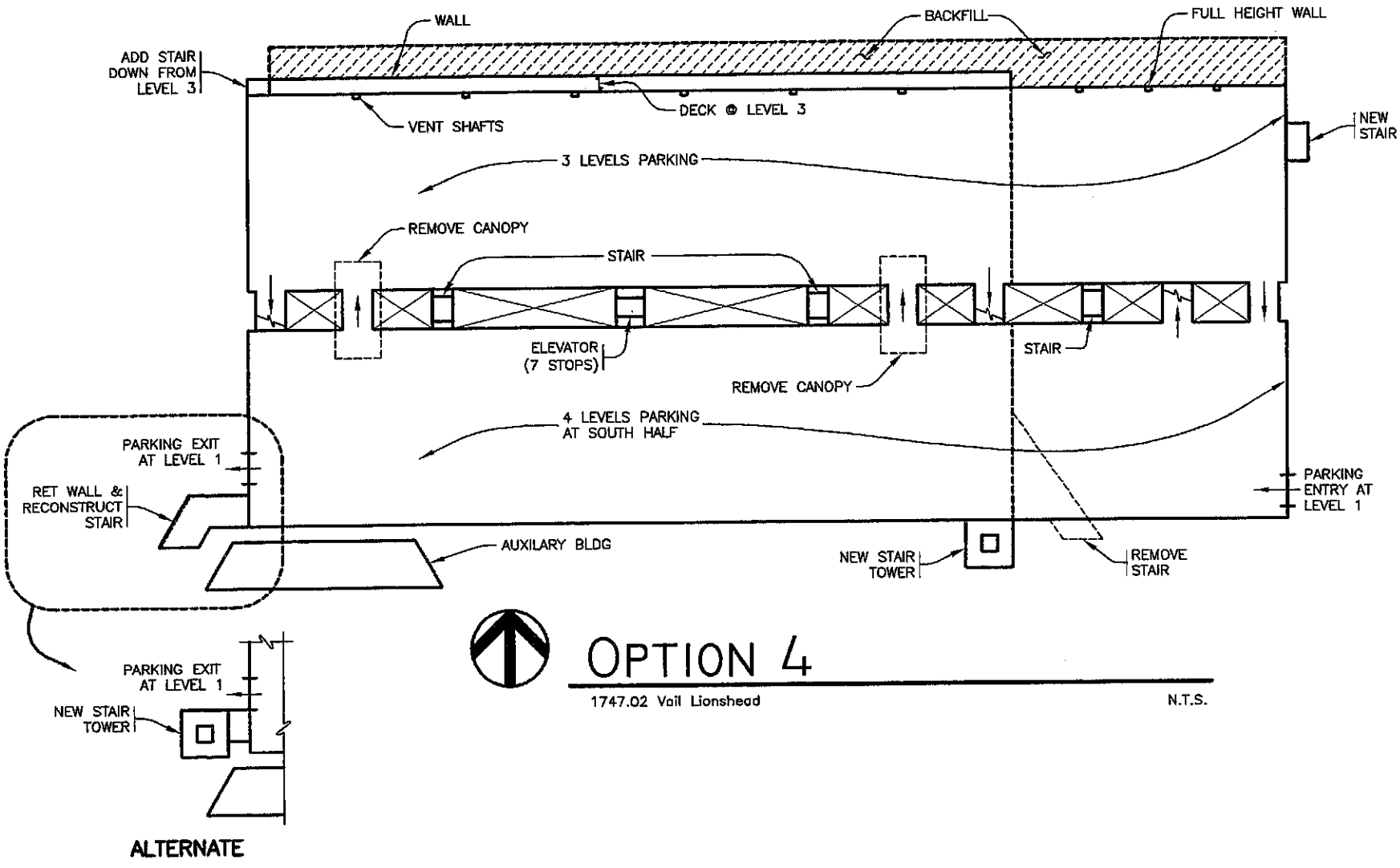

OPTION 4

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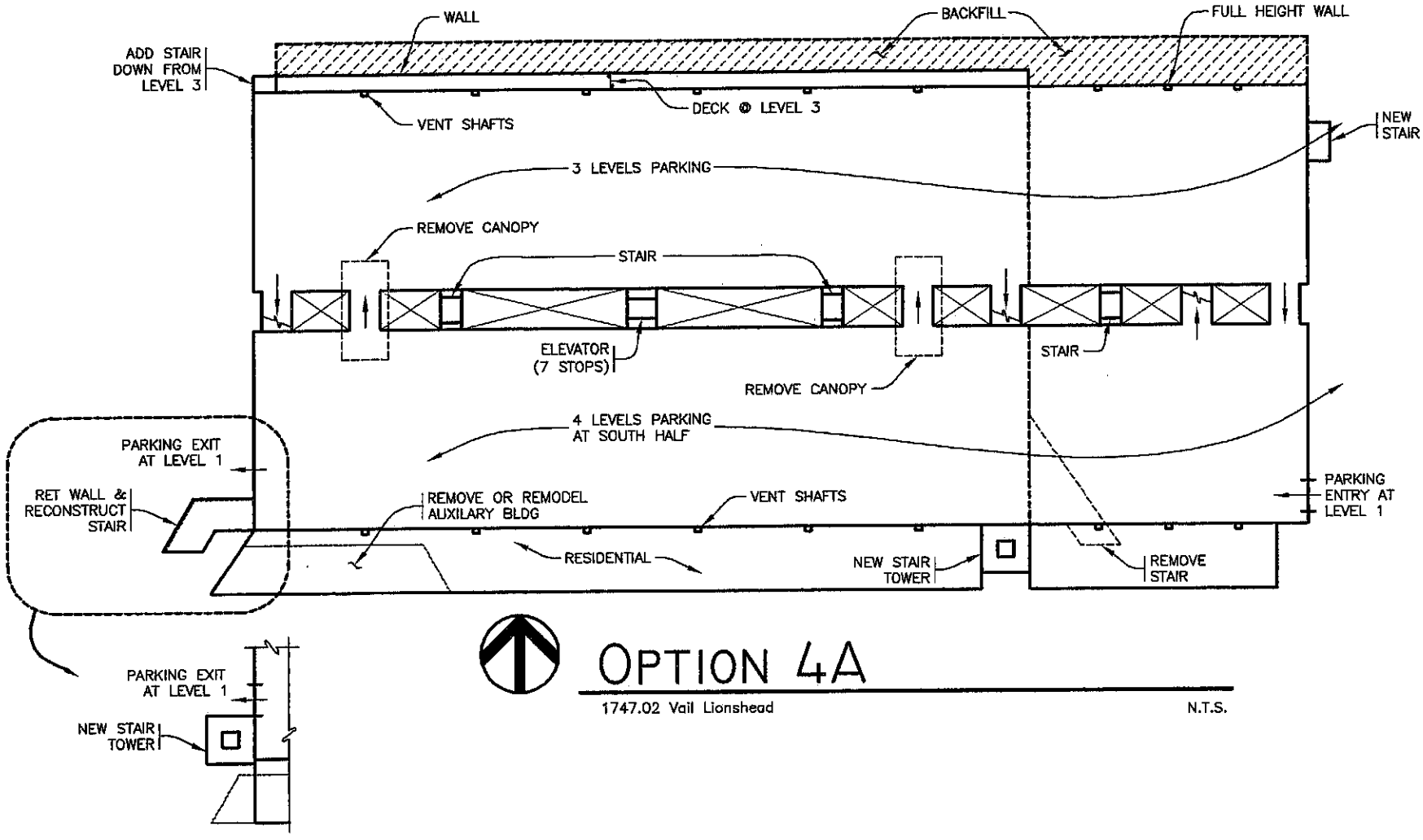

OPTION 4A

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N.T.S.

Cost Estimates for Lionshead Feasibility Study Options

Structural & Architectural	Option 1	Option 2	Option 3	Option 3a	Option 4	Option 4a
Remove SE stair	60,000	60,000	60,000	60,000	60,000	60,000
New stair tower at SE	220,000	310,000	220,000	220,000	220,000	220,000
New stair tower at SW			220,000	220,000	220,000	220,000
Bridge	250,000	250,000				
NW stair shaft	50,000	90,000	50,000	50,000	50,000	50,000
NE stair shaft		90,000	90,000	120,000	90,000	90,000
Remove canopies			5,000	5,000	5,000	5,000
Relocate canopies		20,000				
Prepare column tops		120,000			60,000	60,000
Wall footing mods		350,000			175,000	175,000
Fourth level columns, footings		450,000			225,000	225,000
Widen Ramps	400,000	400,000	400,000	400,000	400,000	400,000
Elevator, shaft & landings	300,000	340,000	300,000	300,000	320,000	320,000
Seismic upgrade		380,000			290,000	290,000
North wall, deck & backfill			300,000	300,000	300,000	300,000
New vent shafts			18,000	27,000	18,000	27,000
Pkg struct extension - 175' to E			6,050,000	6,050,000	7,040,000	7,040,000
4th level pkg struct over exstg		7,550,000			3,900,000	3,900,000
Struct. & Arch. Subtotal:	1,280,000	10,410,000	7,713,000	7,752,000	13,373,000	13,382,000

Cost Estimates for Lionshead Feasibility Study Options

Mechanical & Electrical	Option 1	Option 2	Option 3	Option 3a	Option 4	Option 4a
Power for elevator	9,300	9,300	9,300	9,300	9,300	9,300
Heating for bridge	53,000	53,000	53,000	53,000	53,000	53,000
Service feeder upgrade	3,100	3,100	3,100	3,100	3,100	3,100
Heating for stairs in tower	15,000	15,000	15,000	15,000	15,000	15,000
Power for kiosks	18,000	18,000	18,000	18,000	18,000	18,000
Stair lighting	5,000	5,000	5,000	5,000	5,000	5,000
Bus work	1,000	1,000	1,000	1,000	1,000	1,000
Ventilation under bridge area	32,000	32,000	32,000	32,000	32,000	32,000
Fire Protection	40,000	40,000	40,000	40,000	40,000	40,000
Lighting for new area		152,000				
New stairs light & heat		8,000				
Fire alarm panel upgrade		145,000				
Heating at 4th level ramps		45,000				
Relocate top deck lights		23,000				
Exhaust fans		34,000				
CO detector		13,000				
600 amp service		47,000	47,000	47,000	47,000	47,000
Parking garage to east			924,000	924,000	924,000	924,000
Fire sprinklers (east)			185,000	185,000	185,000	185,000
Fire sprinklers (west)			502,000	502,000	502,000	502,000
North supply fans			81,000	81,000	81,000	81,000
South supply fans				252,000		252,000
4th level pkg garage					619,000	619,000
Mech. & Elect. Subtotal:	176,400	643,400	1,915,400	2,167,400	2,534,400	2,786,400
Total:	1,456,400	11,053,400	9,628,400	9,919,400	15,907,400	16,168,400

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Lionshead Parking Structure
Structural Engineering Study for Potential
Expansion and for Conference Center Overbuild

Prepared for

Mr. Greg Hall, P.E., Director
Dept. of Public Works / Transportation
Town of Vail
1309 Elkhorn Drive
Vail, CO 81657

April 30, 2004
JRH No. 1747.02

Executive Summary

A fourth level may be added to the existing structure. Some differential settlement of the footings may be expected, although this is expected to be relatively minor. The upper parts of the precast columns that extend above the existing third level will need to be removed in order to accommodate connections of new columns. The footings will require modifications.

Widening of the ramps within the existing structure has been evaluated and found to be feasible. Building code requirements for earthquake loads have increased since the structure was designed and built. The unmodified structure appears to be somewhat weaker than would be required by up-to-date building codes, but the deficiency does not appear to be serious. Adding a fourth level does require a significant increase to the resistance of the shear walls in the existing structure.

Various structural modifications are associated with other aspects of schemes for expansion of the parking and for addition of a conference center are also considered. Most schemes require removal and replacement of at least some of the major stair structures at the southeast and southwest corners of the structures. It is feasible to construct such stairs to be sympathetic to the existing architecture.

Construction of the proposed conference center to the east of the garage does not pose any structural challenges. Expansion of the parking garage to the east is similarly straightforward. Construction of the conference center over the garage would be done in a fashion to keep the two structures independent, but it would still require careful geometric coordination of foundation locations. Adequate room appears to exist to place footings for the new construction between existing footings for the garage.

Discussion

Original Design Criteria
Our analysis considered the following information that formed a basis for the original design in 1980 and the deck rehabilitation in 1985:

- Original design strength of concrete obtained from the 1980 structural drawings:
  - Cast-in-place structural concrete: 3000 psi
  - Cast-in-place deck topping and slabs: 3500 psi
  - Precast concrete: 5000 psi
- Total load soil bearing pressure at footings: 5000 psf
- Live load for level 3 deck and ramps (subject to snow & snowplows): 125 psf
- Live load for level 1 and 2 deck and ramps: 50 psf, reducible to 30 psf for large bay areas.
- Original live load of 125 psf at level three was later reduced to 100 psf when 2" additional topping (approximately 25 psf dead load) was installed in 1985.
- Wind and seismic design would have been per the 1979 Uniform Building Code.

Structural considerations for adding a fourth level to the parking structure

- The upper deck for Option 2 needs to be designed for snow and snowplow live load. This is not the case for the upper deck for Options 3 and 4, which are sheltered from snow by the new conference center. We assume that blowing snow that enters the upper deck for Options 3 or 4 would be removed with smaller equipment; highway snowplows would not enter the parking structure.
- The design live load for the deck levels subject to car parking only is 40 psf, reducible to 32 psf for members supporting two or more floors (i.e. columns), which is the requirement of the current building code, IBC 2003.
- The structural concrete was designed in accordance with ACI-318-77. Today we would follow ACI 318-02 (which is advantageous because the required safety factors are lower).
- We have reviewed a copy of "Preliminary Geotechnical Investigation", 7/19/01, by CTL/Thompson, Inc. From it we learn that the site soils consist of dense, silty gravel with cobbles and occasional boulders. The anticipated allowable bearing pressure for footings would be in the range of 5000 psf to 6000 psf. This is similar to the original design value of 5000 psf.

Summary of Structural Analysis

Deck system:

It is reasonable to assume that double tees and topping similar to the original design would be used again. Thus we have assumed the double tees are 9DT30 with 5.5" of topping. We have assumed the spandrel beams would also be similar to the existing for continuity of appearance. A live load of 100 psf at the new level 4 for Option 2 has been assumed to account for snow and snowplows. No structural problems are seen here because this is the same as the original design, which has performed satisfactorily.

Bridge:

We assumed the bridge at the north side of level three for Options 1 and 2 would 54 feet wide, suitable for 4 vehicle lanes plus a 6'sidewalk. We assumed it would be 30 feet long in the N-S direction. It would be supported on an abutment on a spread footing at the north end and on a pier on a spread footing about 8' north of the existing north wall at its south end. In this manner it would be structurally independent from the parking structure. All of this is feasible. The 1980 drawings show a 10' wide utility easement just north of the parking structure, so possible buried utilities may influence the final location of the pier and its footing.

Columns:

We have assumed that precast columns of the same envelope dimensions will be used for appearance reasons. The existing columns are 18" x 18" in cross section, so we assume the new ones will be too. While all the existing columns have the same exterior dimensions, they are not reinforced the same. The single-story columns from level 2 to level 3 on grid A (north side) are reinforced with (12) #9 bars while the two-story columns from level 1 to level 3 on Grids C, D, and F have (12) #11 bars. Both types of columns were checked for the case of a new level 4 deck. Both types were found to be acceptable for receiving a fourth level.

Wall at grids B and E: The precast wall panels, which have large circular openings in them, receive loads from double tees. The wall reinforcement is such that an equivalent column effectively exists between adjacent circular openings. The structural drawings show that each of these "columns" is reinforced with at least (4) #6 bars. It is probable that the panels have additional reinforcement. Assuming a similar wall is constructed directly over the existing walls, we found the existing walls to be satisfactory. A detail that will need to receive special attention is the connection of the new wall panel to the existing at level 3, where there is about 8" of topping reinforced with bar reinforcement over embedded steel connector plates that connect the top of the double tees to the wall.

Continuous Footing at Interior Bearing Walls:
The continuous footings under the bearing walls on grids B and E have insufficient structural capacity for a new fourth level. Modification of these footings will be necessary. The suggested modification is to place reinforced concrete over the existing footing and over and along the long edges. The estimated cost for this modification is $350,000.

Spread Footings at Columns:
The spread footings under the columns on Grids B, C, D, and F are 26" deep x 9'-6" square. These footings were found to be at their maximum structural capacity under the existing conditions. The controlling parameter is punching shear of the column at the footing. The addition of a fourth level will overload the existing footings by approximately 40%. Three possible modifications to address this issue were explored. For each case, the steps would be repeated at all 57 of the primary footings, and a similar modification on a smaller scale to the remaining footings, such as those below the ramps. The three possible modifications are summarized below:

1. Shore the double tees and spandrel beams and then cut off the bottom of the existing column. Place new reinforced concrete over the top of the footing and extending over and around the edges of the footing. The column would be connected and grouted to the top of the new concrete, or
2. Add new concrete over the top of the existing footings and extend it over and around the edges of the footings. This would be placed around the existing column. The columns would be roughened to achieve bond with the new concrete. The new concrete would be post-tensionsed to "clamp" it around the existing column, or
3. Drill holes through the footing, and well into the soil below. Install mini-piers at the bored holes and connect them to the footing. This would require at least four minipiers at each footing.

Complicating all three modifications to the column spread footings is the existing grade-level precast panel, which will also need to be modified in order to create access for the footing modifications. The estimated cost for footing modification 1 is $ 500,000. Cost estimates for the other two modifications, while not specifically computed, are expected to be at least as much.

There is a fourth possibility. Leave the existing footings as-is, and construct new footings located midway between the existing footings. The new footings would support new columns, three stories high, which would support the new parking level four. The columns would penetrate the level two and level three decks, but would not be connected

to those decks. The cost estimate for this approach is $450,000. The appearance of the parking structure would be one with columns at 27' on center for the new upper level, and at 13'-6" o.c. for the lower two levels. Because this eliminates the complications with modifying existing column spread footings, and is more economical, we recommend that it be given serious consideration.

Ramp Widening

We also studied the possibility of widening the ramps within the structure. We found this to be feasible. The inverted tee beams that support the ramp double tees could carry additional double tees over their full width. The column corbels, upon which the inverted tee beams bear, were also found to be adequate. The interior spread footings associated with the ramp columns would have to be modified for increased load resistance for the cases with a fourth level of parking in Options 2 and 4.

Stair Towers

The new conference center of Options 1 and 2 will necessitate removal of the existing stair at the SE. We suggest its function be replaced with a new stair tower, also at the SE. We assumed the stair tower would be architecturally consistent with the existing parking structure, so we have treated it as if it were of precast concrete construction. A 27' x 27' plan dimension would fit against the existing column spacing of the parking structure. The stair tower would be on its own footings.

The existing stair at the SW end would remain for Options 1 and 2. It could remain for Options 3 and 4, but that will require a tall retaining wall on its north side, this to accommodate the proposed parking exit. It would be more cost-effective to remove the existing stair (at least the northern part of it), then construct the retaining wall, then reconstruct the stair. Another alternate, which we recommend, would be to remove the SW stair entirely and replace it with another stair tower similar to the SE stair tower discussed above.

Lateral Loads

Lateral loads from wind and seismic have been evaluated. The IBC 2003 seismic provisions control the lateral design. The present building has two lateral resisting systems. There are shear walls on each side of each expansion joint (grids 7 and 13) to resist N-S lateral loads. The interior bearing walls (with the circular openings) on grids B and E also serve as shear walls to resist E-W lateral loads. Also, the solid wall on the north side on grid A shares the E-W lateral loads for the north half of the parking structure.

The seismic demand will be increased for two reasons. The IBC 2003 stipulates higher seismic accelerations and the fourth level introduces significantly more seismic mass than the present three-level structure. The existing structure was found to have insufficient seismic resistance for the current (IBC 2003) seismic demand. However, as long as modifications do not increase the seismic demand by more than 5%, modification is not mandatory, and the deficiency is probably not extreme. The bridge and elevator would not increase that demand for Options 1 and 3, so no increase in seismic resistance is required for these cases. Options 2 and 4 add a fourth level to all or part of the building. Either variation introduces significantly more seismic demand that the present lateral system can resist. Thus an upgrade of the seismic resistance is necessary for these two options.

The limiting structural elements for Options 2 and 4 are the shear walls at the expansion joints, and the connections of both the tee flanges and the bearing wall to them. One approach to strengthening the shear walls would entail the installation of hold-downs at each end of each shear wall to resist overturning. This could be accomplished by installing anchors in the ground. We have assumed the anchors would consist of 7.5-inch diameter drilled shafts, filled with concrete containing heavy reinforcement (sometimes called "minipiers"). The minipiers would extend to a depth of about 50' below the shear wall footing. The reinforcement would extend up along the ends of the shear walls, and be encased with concrete "bulbs", which are connected to the ends of the walls. See the attached figure.

Level 3, North Side

Options 3 and 4 call for bus loading/unloading on the north side of the existing level 3. To accomplish this, we propose a deck approximately 10' wide be constructed along the length of the existing level 3. It would be supported at the north by a concrete wall bearing on a footing located at approximately the elevation of level 2. The south support of the new deck would be the existing spandrel beam on the north side of the building, which would have to be cut down to permit a drive area over it. This will necessitate a series of columns from the modified level three spandrel to the top of the existing concrete wall at level two. Backfill would be placed and compacted north of this new wall, and brought up to its full height. You could then pave over the compacted backfill, such pavement abutting the new deck at the level three elevation. (We included the deck and backfill in our cost estimates, but did not address site paving). The bus loading lanes could be constructed on top of these features. The air space below the deck would be used as an effective horizontal ventilation shaft to bring in air for levels 1 and 2. The air would be exhausted via a series of ventilation shafts that would penetrate the existing level three deck.

The grade at the extended parking structure to the east would also be raised to level three. Thus the north side of the extended parking structure would be a full-height concrete wall. The backfill would be compacted and you could pave over it as necessary for vehicular access to the new conference center service area. Again, we included the compacted backfill in our cost estimates for the building, but did not address site paving.

Structural Considerations for Elevated Conference Center

The elevated conference center proposed in Options 3 and 4 along with the site constraints has prompted some thinking with regard to lateral load resistance. While this is independent from the parking structure, obviously there will need to be careful coordination with the parking structure. Seismic demands are expected to control over wind loadings. This part of our report is to address these issues, at least at this conceptual phase.

Economics is expected to dictate that the elevated conference center will not be able to bridge the entire parking structure with a single span. Two spans are feasible if a central support is located within the atrium space that is centered within the parking structure. We anticipate the most economical approach will be to design a moment-resisting frame in the north-south direction and a braced frame in the east-west direction. See the attached sketch that illustrates this concept.

In the north-south direction, the central support could be designed as a braced steel structure, with sufficient moment-resisting capacity to resist all the lateral demands. In this way, the outer supports could be relatively small in the N-S direction, saving space on the site. The north and south supports will have to be coordinated with the design of the bus loading area on the north and the residential building on the south. The central supports as conceptualized here would be "pinned" at its footings, so the entire moment resistance would take place at the connection of the floor truss and the central support.

We recommend the central supports be spaced 27' o.c., and be located between the existing parking structure footings. Our preliminary calculations suggest this is feasible.

The north and south supports would be steel frames braced to resist lateral loads in the E-W direction. Diaphragm action within the floor assembly would transfer the E-W lateral forces to the braced frame elements.

While the roof truss could bridge over the entire span, as shown on the sketch, we recommend the conference center be designed with interior columns such that the roof truss spans the same distance as the floor truss.

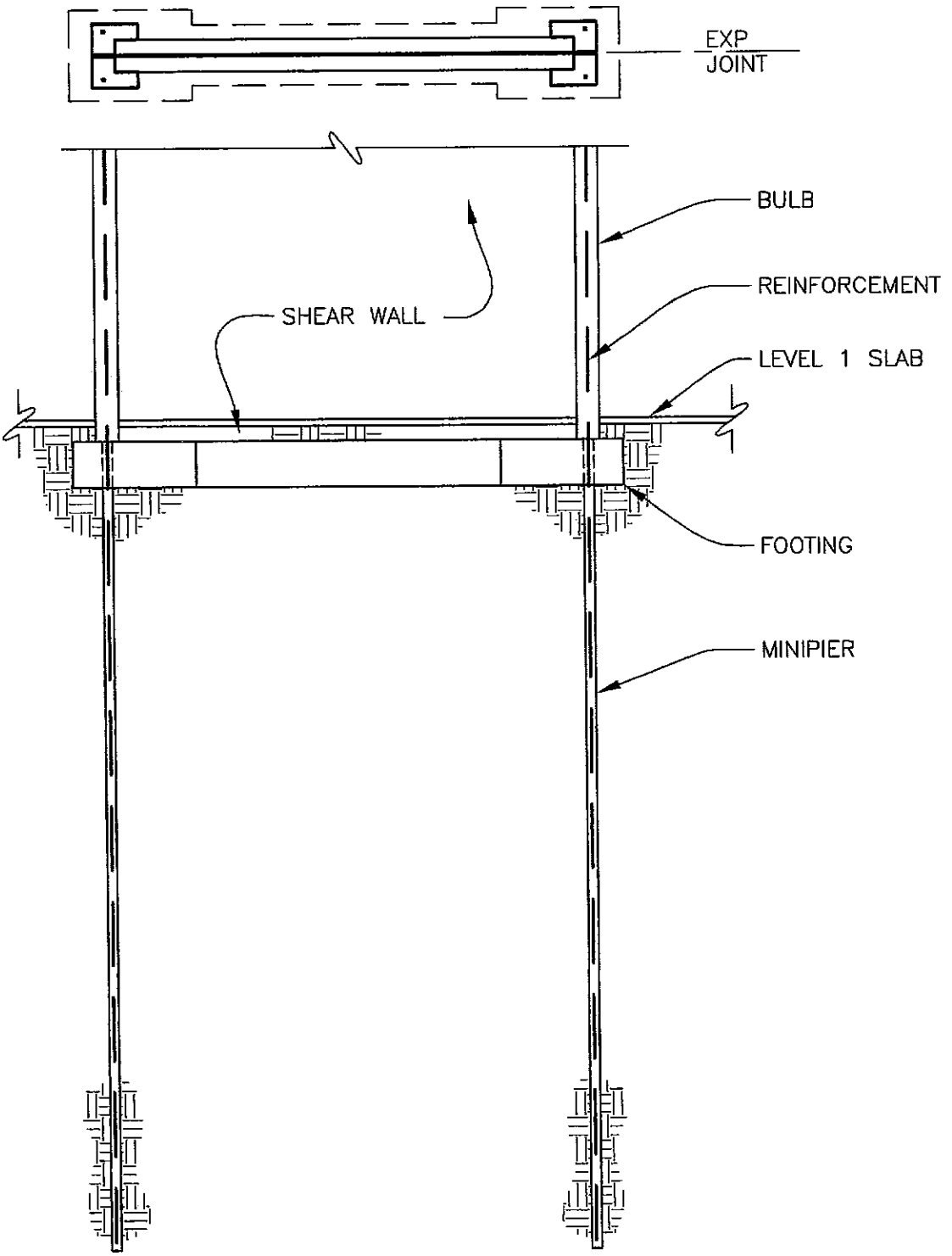
Conclusion
We find the addition of a fourth level and of other potential structural modifications to be feasible provided the issues discussed above are addressed. Further questions can be addressed with additional study.

Very truly yours,
J.R. Harris & Company

Frederick R. Rutz, PE
Project Manager

Reviewed by:

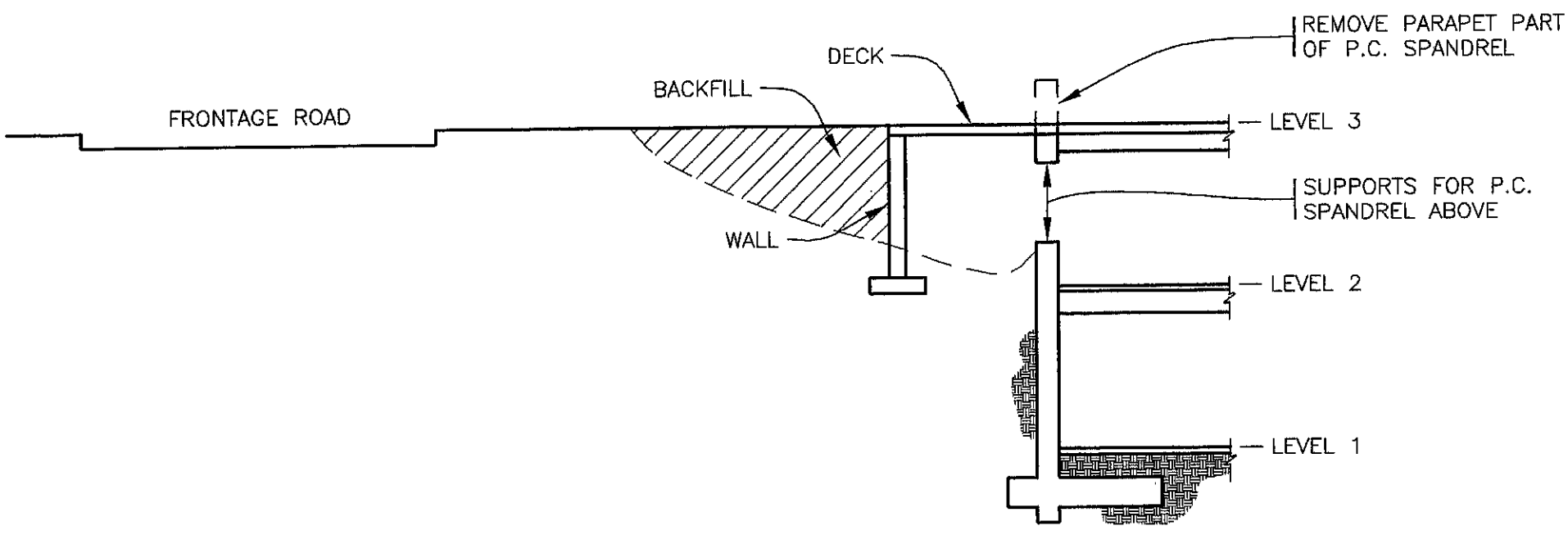
James Robert Harris, PE, PhD



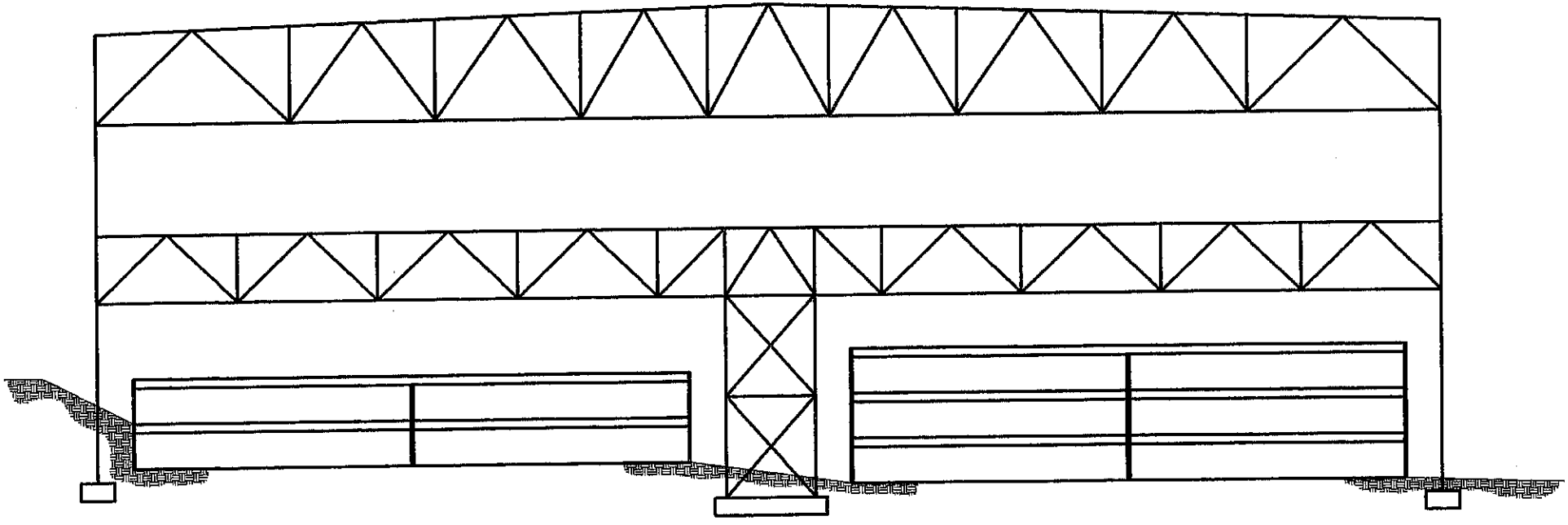
SEISMIC UPGRADE AT N-S SHEAR WALL

1747.02 Vail Lionshead

3/32" = 1'-0"



DECK & BACKFILL ON NORTH SIDE FOR OPTIONS 3 & 4



FRAMING CONCEPT

1747.02 Vail Lionshead

N.T.S.

ARCHITECTURE MATTERS
architecture
interiors
planning
1723
clarkson
street
suite
100
denver
colorado
80218
303 .831.1547
fax .831.1576

LIONSHEAD PARKING GARAGE
& CONFERENCE CENTER
Vail, Colorado

PRELIMINARY FEASIBILITY REPORT
April 20, 2004

Architecture Matters has reviewed the various proposed concepts for a new Conference Center and modifications to the existing Lionshead Parking Garage in Vail Colorado. This report primarily addresses ADA and other accessibility requirements, general public access and egress, fire code considerations, and other incidental architectural issues that may be pertinent to the evaluation of the four proposed options.

The current Lionshead parking structure is three levels of parking with an open light and air well running east-west the length of the structure. Two ramp and stair systems span the open area and connect the north and south sides. At each level the north side of the structure is approximately ½ story higher than the south side. In each half of the structure the area on one level is approximately 60,750 sf (486x125) with 180 to 200 parking spaces. All levels with the exception of Level-1-North are open on at least two sides, with Level 3 being completely exterior.

The site slopes down from north to south so that Level-1-South is at grade on the south side of the structure and provides pedestrian access to the Dobson Ice Arena to the southeast and to Lionshead Village and ski lift to the southwest. Vehicle access is currently on the east side of the structure via direct at-grade access to Level-3-North and to Level-2-South. In addition to the two stairs in the center of the light-well there are large stair structures at the southeast and southwest corners of the structure and smaller stairs at the northeast and northwest corners that provides egress from Level 1 up to at-grade exit at Level-2-North.

Handicapped Parking currently consists of 12 spaces at Level-1-South, however, overhead clearances do not allow van access to that level. Van parking is only possible at Level 3. A very small separate building on the southwest side of the garage currently provides limited retail, office and service space and is not being considered in this evaluation.

Comments that follow reference the 2003 International Building Code (IBC), the 1991 Americans with Disabilities Act (ADA), and the 1994 Fair Housing Act. The Parking Garage is an S-2 open parking garage occupancy, except for Level-1-North which is classified as an enclosed garage (UBC Chapt 3), and is of construction Type I-A or I-B, which allows unlimited area and up to 12 tiers in height (IBC Table 406.3.5). The new Conference Center is an A-2 or A-3 occupancy (UBC Chapt 3) and because of the large proposed area will need to be of construction Type I-A or I-B which allows unlimited area and up to 11 stories in height (IBC Table 503).

For all of the options presented, rest room facilities to serve only the Parking Garage are not required.

None of the following discussion addresses site and infrastructure reconfiguration that would be required by each option.

OPTION 1:

PARKING GARAGE: The new Conference Center would eliminate the existing east side entry to the parking garage, and the southeast stair structure from Level 3 to Level 1. Parking Garage work for this option would require a new bridge structure for vehicle access to Level-3-North over a swale on the north side of the current garage, and a new stair structure near the southeast corner. The bridge also includes a pedestrian sidewalk.

CONFERENCE CENTER: A new two story 126,000 sf building (approximately 63,000 sf per floor) to the east of the existing parking garage.

OPTION 2:

PARKING GARAGE: Work described in Option One plus the addition of a fourth level of parking on both the north and south portions of the building (adding roughly 380 new spaces) with the necessary extension of vertical circulation to the additional level.

CONFERENCE CENTER: Same as Option One

ADA & ACCESSIBILITY (OPTIONS 1 &2)

- Level 1 handicapped parking is well placed at Level-1-South of the Parking Garage, however, additional spaces are required for ADA compliance and the required van accessible spaces cannot be accommodated on Level 1. Level 3 is the logical place to provide van spaces in addition to several additional handicapped spaces to serve the new Conference Center, however, elevator access to the first floor and south street level is needed from that level. The additional level of parking in Option 2 should be planned with sufficient height to accommodate van clearances.
    - Assuming that the current structure has approximately 1135 spaces, IBC and ADA require 21 or 22 handicapped spaces for Option 1 and 26 for Option 2 (Table 1106.1).
    - ADA requires that 1 in every 8 HC spaces be van accessible, and IBC requires 1 in 6 (1106.5). Therefore, 4 of the total handicapped spaces would be van accessible in Option 1 and 5 in Option 2.
    - Handicapped spaces may share an access aisle. Thus two handicapped spaces require 8' each with a 5' aisle between them. Van accessibility requires 8' spaces with an 8'aisle between.
    - Assuming the existing 12 HC spaces are fairly efficiently laid out, by sharing access aisles the additional HC spaces would require approximately 21 additional linear feet for Option 1, or the loss of 2 or 3 current parking spaces. Total Option 2 spaces will depend on the eventual layout of the additional parking level.
- It appears that the second floor of the new Conference Center would be at the same elevation or very close to that of Level-3-South of the Parking Garage. It would also seem that the Conference Center would benefit from a connection to the Parking Garage at that level. Therefore, the most efficient and cost effective strategy to provide street level access from the Level 3 HC spaces would be to utilize one of the elevators that will already be required in the two story Conference Center. Design of the vertical circulation in the new building could fairly easily accommodate this continuous function with some ability to secure the rest of the building between scheduled events.
- Although it would not be required by code or ADA an additional elevator near the west end of the building might be an appropriate convenience for both handicapped persons and the general public. However, since this elevator would be highly available to the public, ski equipment would almost certainly necessitate higher interior maintenance of that elevator than would be typical in most other locations.

- In all of the proposed options, handrails at all of the existing stairs should be evaluated and redesigned to comply with the current code and ADA requirements for rails on each side and to provide the required overruns at both the top and bottom of each stair run.

ACCESS / EGRESS (OPTIONS 1 & 2)

- For both of these options a small stair at the northwest corner of the building to allow egress to grade from Level 3 should be added. For Option 2 this stair will need to serve Level 4 and a stair at the northeast corner will need to be added to provide egress from Level 4 to the sidewalk exit on the vehicle bridge at Level 3
- With the replacement of the southeast stair structure, travel distances in all parts of the garage are within code. (Maximum exit access travel distance in S-2 occupancies is 300 feet. For the typical 125 foot by 486 foot module of garage with exits at the two atrium stairs and the two extreme corners, all points within the module are within the 300 foot limit.)
- Exit width from the Parking Garage is adequate, and would not be affected by the additional level of parking in Option 2.
- If the strategy for handicapped access to elevators in the Conference Center is utilized, special care should be given to the design of the new southeast stair structure to create an attractive and easily navigated amenity that encourages the majority of pedestrian traffic in that location to use it instead of entering the Conference Center.

FIRE SEPARATION (OPTIONS 1 & 2)

- A fire sprinkler system is required by the 2003 IBC in the enclosed Level-1-North portion of the Parking Garage (IBC 903.2.9). There is no system there at this time. This upgrade may not be required with the amount of work that is anticipated in Option 1 but would almost certainly be required for Option 2
- The occupancy separation required between an A-2 or A-3 occupancy and an S-2 occupancy is 2 hours (IBC Table 302.3.2).
- With the close proximity that is proposed between the two structures, occupancy separation will need to be addressed with each option. This should not present any significant problems in Options 1 & 2, since the west wall of the new Conference Center building can be designed to provide the required fire rating and can have a minimum of openings. The existing openings in the east side of the parking garage can also be closed to provide needed ratings with little effect on open garage requirements. Area separation should not be a problem with the unlimited area allowed by Type 1 construction.

OPTION 3:

PARKING GARAGE: Extend all three levels of parking to the east approximately 175 feet, adding roughly 400 new spaces. Provide a new vehicle entrance on the east to Level-1-South and vehicle exiting control on the west from Level-1-South. Provide a new stair structure or modify the existing stair from all levels of parking at the southwest corner of the garage, and add a new stair structure at a central location on the south side of the structure. Continue the central air/light-well in the expanded parking area and add an additional ramp and stair system similar to those in the light-well of the existing garage. Provide an additional stair structure on the new east side of the parking garage.

CONFERENCE CENTER: Provide a new one story conference center over the top of the extended parking garage. The Conference Center would be approximately 700 ft long east to west and approximately 300 ft north to south, for a total of approximately 200,000 sf. Also proposed for this option is a new Transit Center and Conference Center Service Entry on the north side of the building at garage Level-3-North.

OPTION 4:

PARKING GARAGE: Include the same work described in Option 3 as well as an additional level of parking on the south half of the existing and extended parking garage. This would provide another roughly 250 parking spaces in addition to those added in Option 3. South side vertical circulation structures for the garage as described in Option 3 would be extended to Level-4-South

CONFERENCE CENTER: Same as Option 3 with the necessary additional height to accommodate the fourth level of parking.

ADA & ACCESSIBILITY (OPTION 3 & 4)

- Handicapped parking for visitors to the Dobson Ice Arena and Lionshead Village would continue to be located on Level-1-South in the Parking Garage, although current spaces would likely be reconfigured with the reorientation of vehicle access and exit control. Additional handicapped spaces for cars should also be distributed on other levels in close proximity to Conference Center elevator cores. Handicapped van access remains a problem and will need to be accommodated on Level 3. Access to that level for this purpose will need to be incorporated into either the new Transit Center or the Conference Center Service Entry. Elevator access to the first floor and south street level from Level 3 can be accommodated in the proposed Conference Center elevator cores with similar separation strategies as those discussed in Option 1. The Conference Center will necessarily be planned with sufficient height above the parking garage to accommodate van clearances at Level 3.
    - IBC and ADA would require approximately 27 handicapped spaces for Option 3 and 30 for Option 4 (IBC Table 1106.1).
    - The IBC requires that 1 in every 6 HC spaces be van accessible. Therefore, 5 of the total handicapped spaces would need to be van accessible in both Options 3 and 4 (IBC 1106.5).
    - The actual number of each type of handicapped parking will be figured when final parking layouts are completed.
- Although not required, an additional elevator to serve the parking garage might be a desirable convenience. A central location in conjunction with the new south side stair would be a logical choice. This elevator could be of a very utilitarian design since it would be used primarily by skiers

with their equipment, as well as for possible handicapped access to and from Level 3. The location for this stair should be coordinated to avoid crossing vehicle entry and exit control lanes on Level 1.

ACCESS / EGRESS (OPTIONS 1 & 2)

- For both Option 3 & 4 care must be taken to either preserve or replace the northwest stair access from Level 1 and 2 for at-grade exit at Level 2, or to extend that stair for at-grade exit at Level 3. If the Level 2 exit is maintained, egress from the northwest corner of Level-3-North can be at the new Transit Center and Conference Entry area.
- Exit widths from the Parking Garage should be adequate with the additional stairs described. It would be logical to incorporate the Garage exiting with that which will be required for Conference Center egress. Width and distance considerations for the Parking Garage should also include those required by the assembly occupancy nature of the Conference Center above.
- As presented in the proposed concept plans for the Conference Center the main vertical circulation connecting all levels of the Parking Garage and the Conference Center lobby is in one location on the west side of the structure. It seems imperative that other similar circulation cores be added. The logical choice would be to co-locate these with the Garage stair structures at the east and south side of the complex. The south location would serve likely pedestrian traffic from the southeast without crossing vehicle traffic lanes into the garage, and the east location would eliminate the excessive travel distances incurred when parking on the east side of the Garage to access the Conference Center, especially if activities are even further removed by being at the east end of the Conference Center.

FIRE SEPARATION (OPTIONS 1 & 2)

- A fire sprinkler system is required by the 2003 IBC in S-2 buildings located beneath other occupancy groups (IBC 903.2.9). Options 3 & 4 would require that the Parking Garage be fully sprinkled.
- Although the central air-well would technically remain open to the atmosphere vertically and then horizontally at Level 3, the structure above may very well limit its effectiveness. It also seems likely that the proposed Transit Center and Conference Center Service Entry in these two options would severely limit the available amount of qualified openings on the north side of Level-2-North. Thus Level-1-North and Level-2-North should be treated as enclosed parking garage areas.
- A horizontal 2 hour occupancy separation is required between an A-2 or A-3 occupancy and an S-2 occupancy (IBC Table 302.3.2).
- Because the bottom side of the new Conference Center structure is so accessible from below, care should be taken so that the fire suppression system at that location also protects the underneath side of the new structure.

OTHER CONSIDERATIONS (OPTIONS 1 & 2)

- Additional Parking Garage ventilation to accommodate the more enclosed nature of Options 3 & 4 will require that some care be taken to locate mechanical equipment to avoid acoustic and vibration disturbance of Conference Center activities. With the depth of structure required and the height available between the Parking Garage and the Conference Center these issues should be easily addressed.

ALTERNATIVE "A" (for consideration with all options 1-4)

RESIDENTIAL & RETAIL: For each Option 1 through 4 add a structure to the south side of the Parking Garage to provide Retail space on the ground floor (parking Level-1-South) and as many as four levels of Residential units above. This addition would eliminate or incorporate the existing auxiliary building at the west end of the available site. The area that is available for this addition is approximately 40 ft deep from the south garage wall to the sidewalk, and is approximately 480 ft long for Options 1 & 2, and 640 ft long for Options 3 & 4.

ADA & ACCESSIBILITY (ALTERNATIVE A)

- ADA is applicable to the ground floor Retail spaces. At-grade access is easily attained and handicapped parking is available in the parking garage.
- The Residential portion of this option is not governed by the ADA, however accessibility is addressed by Chapter 11 of the IBC, the Federal and State Fair Housing Acts, and CRS 9-5 revised in 2003. Elevator access to each level would be required to make the units "visitable" and "adaptable." It seems reasonable that this elevator access could be incorporated with the needs of the parking structure as discussed in previous options.

ACCESS / EGRESS (ALTERNATIVE A)

- The long, shallow foot print of the south side addition offers some challenges, especially for circulation.
- Second exits that will be required for all except the smallest of retail spaces will need to be on the same (south) side as the primary entrance. This is typically not a difficult situation, however service access is not ideal when not directly into "back of the house" areas. Providing a service lane within the Parking Garage to serve the Retail spaces is not a viable option, since it would reduce parking, and since Level 1 does not accommodate the typical delivery vehicle. Therefore, service access for the Retail spaces should be planned on the street south of the complex.
- Exits from the Parking Garage through the Retail/Residential block would almost certainly be required, or at least desired, at locations other than the ends of the building, especially for Options 3 & 4. These openings could provide a means to break up the long, linear massing visually as well as providing area separations that may be needed. In addition, Options 3 & 4 show a stair structure somewhere in the middle of the south side of the Parking Garage. This structure, with the addition of an elevator, could also serve the Residential levels of Option A.
- Because the proposed Residential block is so shallow, access to the various units will either have to be via a series of numerous vertical stairs (which are problematic for accessibility requirements) or via linear access along the length of the Residential block. This access could be interior or exterior and run either on the south side or between the Residential block and the Garage.
- Because the south side provides the only exterior exposure, access on the south side would need to be an exterior system.
- Acoustic, vibration, and ventilation separation between the Parking Garage and Residential units will be critical. The ability to use a circulation element, such as a corridor or an open breezeway, as a buffer between the two occupancies could be advantageous.

CONSTRUCTION TYPES (ALTERNATIVE A)

- The Retail portion of Alternative A is an M (Mercantile) occupancy group and the Residential portion is an R-2 (IBC Chapt 3). Because retail and residential construction would typically not be of Type I, I would anticipate that this portion of the project would more likely be of a Type III-A construction. That construction type allows a total single story area of 18,500 sf for retail and 24,000 sf for

residential without taking advantage of any area increases (UBC Table 503). With setbacks, allowable area increases, and area separation strategies this construction type seems appropriate. A less restrictive construction type might also be achievable when actual design is underway.

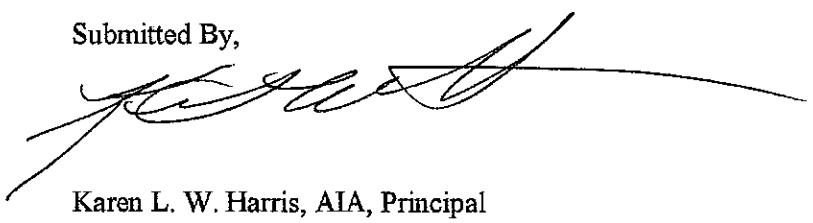
FIRE SEPARATION (ALTERNATIVE A)

- In order for any side of a parking garage to be considered as open, it must have opening that are 20% of the wall area and 40% of the perimeter (406.3.3.1), with a fire separation distance of at least 10' (IBC Table 704.8). Thus, any building on the south side of the Parking Garage would need to be at least 20' away in order to retain the open parking garage designation.
- The Retail/Residential block is not viable with a 20' separation, and therefore, will necessarily create an enclosed parking garage at all levels, except for the top level in Options 1 & 2. The consequences of this are primarily in ventilation and fire suppression requirements. The impact of this addition is the least for Options 3 & 4 since these options already affect many of the open garage characteristics.
- A fire sprinkler system is required by the 2003 IBC in enclosed parking garages (903.2.9), thus with any of the proposed options, addition of the Retail/Residential block would require the Parking Garage be fully sprinkled.
- A 2 hour occupancy separation is required between each of the occupancy groups (Assembly, Parking, Retail, Residential) represented in the various proposed options (Table 302.3.2). This separation is relatively easily achieved with the closing of the south Garage wall and protection of the limited openings through that wall.

OTHER CONSIDERATIONS (ALTERNATIVE A)

- Zoning requirements for parking for Residential units may impact available spaces in the Parking Garage. A strategy other than use of the Parking Garage may need to be considered for resident parking.

Submitted By,



Karen L. W. Harris, AIA, Principal
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April 26, 2004

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Attn: Fred Rutz, P.E.
J.R. Harris & Company
1776 Lincoln St., Suite 1100
Denver, CO 80203-1080

Re: LIONSHEAD PARKING GARAGE AND CONFERENCE CENTER, VAIL, COLORADO - MECHANICAL & ELECTRICAL EVALUATION AND COST MODEL
BA Job # 04-017

Dear Fred:

I visited the site with an electrician April 1, 2004 to observe the conditions as they exist both mechanically and electrically. The level one electrical room was opened by site personnel and we removed the fronts of the switch gear, panels, etc. to observe the condition of the wiring, the terminations, noted the capacities, made comparisons to the one-line diagram on the drawings and observed any code deficiencies. We also utilized our infrared scan thermal gun to see if any devices or connections were overheating.

Observations:

A. The current transformer enclosure and General Electric AV-Line switch board are rated at 400 amp, 277/480, 3-phase, 4 wire with a 400 amp neutral. The feeders are 2 parallel underground runs of 4 #4/0 THW aluminum in what appears to be 2'1/2" conduit (plans show 2" conduit). The switchboard is a main lug only panel and has a total of 5 handles, 6 allowed without a main disconnect per the National Electrical Code.

B. The panels on the drawings are generally as shown with the 277/480 volt EM panel, LA panel, panel LA feed 30kva 120/208 3-phase transformer which feeds panel RA, 60 amp switch in the MDC feeds a 45kva 120/208 3-phase 4 wire transformer which feeds panel TB.

C. Added panel SP-2 is a subfeed from RA, it is a 12ckt 100 amp panel.

D. Added is the ramp heat panels and contactors which do not appear on the drawings.

E. Added subpanel feed for Christmas light panel.

F. We observed that one neutral was tied onto the ground bus which should be tied onto the neutral bus in the MDC.

G. We observed that panel RA has been wet on the interior, corrosion on enclosure, breakers, termination buses indicate a need to seal water entry into room and avoid water entering the raceways. The panel should be replaced when upgrades are considered.

H. The fire alarm panel is not an addressable system and the remaining 4 spare zones are not enough to allow for any expansion. The system will need to be replaced with an ADA compliant addressable system. The system appears to be operational.

I. The mechanical system, i.e., exhaust fans, were not running during the visit, as the garage was lightly loaded with vehicles, however the systems are in place.

J. The lowest level northeast corner quadrant away from the courtyard should have a dry type sprinkler system installed to meet code.

Return visit, I visited the site a second time April 21, 2004 with the purpose of obtaining the meter information to obtain the maximum demand in the past year from Holy Cross Electric. I obtained the computer printout and found the peak 172kw in the January-February billing cycle which translates into 206 amps of the 400 amps available.

Options Mechanical/Electrical Impact:

Option 1 Add
1. Elevator.
2. Bridge heated slab.
3. Heated stair tower treads.
4. Toll booth power, lights, controls.
5. Lighting for the new stairs.
6. Disconnect the bus outlets.
7. Fans, power, ducts for second level obstructed by bridge.
8. Fire protection sprinklers for second floor under bridge in northeast corner.

Option 2 Add
1. Option 1.
2. Lighting the new area.
3. Electric accommodations for two new stairs to new level.
4. Addressable fire alarm system for the entire building.
5. 4th level ramp heat.
6. Speed exhaust fans, relocate up one level, side duct.
7. Extend CO monitoring.
8. New electrical service.

Option 3 Add
1. Option 1 plus service upgrade.
2. Option 1 plus service upgrade of Option 2.
3. 180 x 275 x 3 levels mechanical/electrical combined square foot numbers.
4. Fire sprinkle the new addition on three levels.
5. Provide mechanical and electrical to ventilate garage from fans and ductwork under the bus staging area.

Option 3A
1. Option 3.
2. South supply fan system, ducts, fans, control electrical.

Option 4
1. Option 3.
2. (486 + 180) x 125 at the square foot rate for the added area of parking.
3. Sprinkle the 83,250 square feet of added area.

Option 4A
1. Option 4.
2. The supply system fan for ventilation of the garage adjacent to the housing complex.

The Opinions of Probable Cost are derived from Means Electrical Cost Data, personal experience, and include the industry standard 25% added for mountain work. The figures presented include subcontractor profit and overhead.

Please let me know if you need anything further.

Sincerely,

BURKE ASSOCIATES, INC.
John F. Cunningham, P.E., C.C.E.
President

JFC/jed

OPINION OF PROBABLE COST								
								Job #04-017
Project Title:	Lionshead Parking Structure, Vail							
Prepared For:	Fred Rutz, J.R. Harris & Company							
Prepared By:	John F. Cunningham							
Date: May 4, 2004								Page 1 of 4
Description	**Quan**	**Unit**	**$/Unit**	**Total**	**Rate**	**Total**	**Misc**	**TOTAL**
XXXXXXXXXXXXXXXXXXXX	XXXXX	XXX	XXXXX	XXXXXXX	XXXXX	XXXXXXX	XXXXXX	XXXXXXXXX
Mechanical/Electrical - OPTION 1								
Service size adequate @ 400A								
172 KW Peak Demand = 206A								
Elevator 50 hp feed	300	l.f.	26.41	$ 7,923.00			$0.00	$ 7,923.00
70A Shunt Trip Breaker							$1,325.00	$ 1,325.00
Heated Bridge	4200	sq.ft.	12.5	$ 52,500.00			$0.00	$ 52,500.00
Service Feeder Upgrade to 400A	800	l.f.	3.81	$ 3,048.00			$0.00	$ 3,048.00
Heated Stairs 2 Tower, 600 sq.ft.	1200	sq.ft.	12.5	$ 15,000.00				$ 15,000.00
Kiosks - Main Feed 50A	300	l.f.	25.33	$ 7,599.00				$ 7,599.00
Kiosks - Power, Light, Heat Control	4	allow	2500	$ 10,000.00				$ 10,000.00
Stair Lighting - 4 runs/stair per floor								
2 stair	16	allow	300	$ 4,800.00				$ 4,800.00
Extend Feeder from Ground Bus to								
Neutral Bus	1	allow					$500.00	$ 500.00
Disconnect Bus Outlets	1	lot					$500.00	$ 500.00
Power for 2 second level bridge								
Obstruction Fan for second								$ -
level - 10,000 CFM, ea. 2 HP	600	l.f.	10.67	$ 6,402.00				$ 6,402.00
3#12THWN IGC								
Breaker - 20A 3P	1	ea	70	$ 70.00				$ 70.00
Starter - 2 HP	2	ea	531	$ 1,062.00				$ 1,062.00
Fans	2	ea	1531	$ 3,062.00				$ 3,062.00
Controls - Existing (extend)	1	lot		$ -			$1,000.00	$ 1,000.00
Ducts 60" Concrete	80	l.f.	200	$ 16,000.00				$ 16,000.00
Inlet Louvres 96 x 96	32	sq.ft.	50	$ 1,600.00				$ 1,600.00
Trench & Backfill for Ducts	80	l.f.	30	$ 2,400.00				$ 2,400.00
Fire Protection Sprinklers	29640	sq.ft.	1.25	$ 37,050.00				$ 37,050.00
3" Main & Dry Pipe Valve	100	l.f.	25	$ 2,500.00				$ 2,500.00
SUB-TOTAL				**$ 171,016.00**		**$0.00**	**$2,325.00**	**$ 174,341.00**

OPINION OF PROBABLE COST								
								Job #04-017
Project Title:	Lionshead Parking Structure, Vail							
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Prepared By:	John F. Cunningham							
Date: May 4, 2004								Page 2 of 4
Description	**Quan**	**Unit**	**$/Unit**	**Total**	**Rate**	**Total**	**Misc**	**TOTAL**
XXXXXXXXXXXXXXXXXXXX	XXXXX	XXX	XXXXX	XXXXXXXX	XXXXX	XXXXXXXX	XXXXXX	XXXXXXXXXX
Mechanical/Electrical - OPTION 2								
Total of Option 1 Items								$ 174,341.00
Plus: Add 4th Level								
Lighting Fixtures & Wire	152	ea	1000	$ 152,000.00				$ 152,000.00
New Stair Landing Light	8	allow	300	$ 2,400.00				$ 2,400.00
New Stair Tread Heat	400	sq.ft.	12.5	$ 5,000.00				$ 5,000.00
Fire Alarm Panel must be upgraded;								
Vail Fire Marshal will require a full								
Replacement to an Addressable								
System, replacing all devices.								
Addressable System Panel	1	lot	7000	$ 7,000.00				$ 7,000.00
Code Transmitter	1	lot	870	$ 870.00				$ 870.00
ADA Horn Strobes	36	ea	190	$ 6,840.00				$ 6,840.00
Break-Glass Stations	6	ea	137	$ 822.00				$ 822.00
Graphic Annunciator	1	ea	1500	$ 1,500.00				$ 1,500.00
Battery Rack & Charger	1	ea	1415	$ 1,415.00				$ 1,415.00
Heat Detectors	384	ea	227	$ 87,168.00				$ 87,168.00
Conduit Allowance	4000	l.f.	5.95	$ 23,800.00				$ 23,800.00
Wire Allowance	8000	l.f.	1.96	$ 15,680.00				$ 15,680.00
Heat 4th Level Ramps	3600	sq.ft.	12.5	$ 45,000.00				$ 45,000.00
Re-Locate Top Deck Lighting	14	ea	1600	$ 22,400.00				$ 22,400.00
Speed Exhaust Fans: New Motors,								
Drives, Starters	12	allow	2831	$ 33,972.00				$ 33,972.00
(Speed, Re-locate & Re-Duct)								
Carbon Monoxide Detector	22	ea	500	$ 11,000.00				$ 11,000.00
CO Monitor Wiring	1000	l.f.	1.96	$ 1,960.00				$ 1,960.00
New 600 Amp Service:								
New Trench Sawed for Feeders Condu	300	ft					$28,540.00	$ 28,540.00
New 600 Amp CT,	1	ea	2100	$ 2,100.00				$ 2,100.00
MDP Panels & Breakers	1	ea	10212	$ 10,212.00				$ 10,212.00
New RA with 400 Amp	1	ea	5560	$ 5,560.00				$ 5,560.00
(Bus & Main Double Tub								
84 circuits. Rewire RA circuits								
to new breakers)				$ -				
SUB-TOTAL				**$ 436,699.00**		**$0.00**	**$0.00**	**$ 639,580.00**

OPINION OF PROBABLE COST								
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Prepared By:	John F. Cunningham							
Date: May 4, 2004								Page 3 of 4
Description	**Quan**	**Unit**	**$/Unit**	**Total**	**Rate**	**Total**	**Misc**	**TOTAL**
XXXXXXXXXXXXXXXXXXXXXX	XXXXX	XXX	XXXXX	XXXXXXXX	XXXXX	XXXXXXX	XXXXXX	XXXXXXXXXX
Mechanical/Electrical - OPTION 3								
Total of Option 1 Items, PLUS								$ 174,341.00
Service Upgrade of Option 2								
New 600 Amp Service:								
New Trench Sawed for Feeders Condu	300	ft					$28,540.00	$ 28,540.00
New 600 Amp CT,	1	ea	2100	$ 2,100.00				$ 2,100.00
MDP Panels & Breakers	1	ea	10212	$ 10,212.00				$ 10,212.00
New RA with 400 Amp	1	ea	5560	$ 5,560.00				$ 5,560.00
(Bus & Main Double Tub								
84 circuits. Rewire RA circuits								
to new breakers)				$ -				
Parking Garage to East (Mech/Elec/Plbg)	148000	sq.ft.	6.24	$ 923,520.00				$ 923,520.00
Sprinkle Garage (new)	148000	sq.ft.	1.25	$ 185,000.00				$ 185,000.00
Sprinkle Garage (Old)	400950	sq.ft.	1.25	$ 501,187.50				$ 501,187.50
North Supply Fans	8	ea	1200	$ 9,600.00				$ 9,600.00
Underground Duct 60"	180	l.f.	200	$ 36,000.00				$ 36,000.00
Plenum Boxes	2	ea	1200	$ 2,400.00				$ 2,400.00
Duct Risers	8	allow	3000	$ 24,000.00				$ 24,000.00
Trench & Backfill	180	l.f.	30	$ 5,400.00				$ 5,400.00
Inlet Louvers	64	sq.ft.	50	$ 3,200.00				$ 3,200.00
Total - OPTION 3								
$ 1,911,060.50								
Mechanical/Electrical - OPTION 3A								
Option 3, PLUS:								$ 1,911,060.50
South Supply Fans 30,000 CFM	8	ea	1700	$ 13,600.00				$ 13,600.00
Underground Duct 80" Concrete	700	l.f.	200	$ 140,000.00				$ 140,000.00
Plenum Boxes	8	ea	1200	$ 9,600.00				$ 9,600.00
Duct Risers	8	allow	6000	$ 48,000.00				$ 48,000.00
Trench & Backfill	700	l.f.	35	$ 24,500.00				$ 24,500.00
Inlet Louvers	64	sq.ft.	50	$ 3,200.00				$ 3,200.00
Electrical Power for Fans	800	l.f.	10.67	$ 8,536.00				$ 8,536.00
Starters	8	ea	500	$ 4,000.00				$ 4,000.00
Total - OPTION 3A:								
$ 2,162,496.50								

OPINION OF PROBABLE COST								
								Job #04-017
Project Title:	Lionshead Parking Structure, Vail							
Prepared For:	Fred Rutz, J. R. Harris & Company							
Prepared By:	John F. Cunningham							
Date: May 4, 2004								Page 4 of 4
Description	**Quan**	**Unit**	**$/Unit**	**Total**	**Rate**	**Total**	**Misc**	**TOTAL**
XXXXXXXXXXXXXXXXXXXXX	XXXXX	XXX	XXXXX	XXXXXXXX	XXXXX	XXXXXXX	XXXXXX	XXXXXXXXXX
Mechanical/Electrical - OPTION 4								
Total of Option 3, PLUS								$ 1,911,060.50
Added (486 + 175) x 125	82625	sq.ft.	6.24					$ 515,580.00
Parking Garage								
Sprinkle Added Garage Area	82625	sq.ft.	1.25	$ 103,281.25				$ 103,281.25
Total - OPTION 4								
$ 2,529,921.75								
Mechanical/Electrical - OPTION 4A								
Option 4, PLUS:								$ 2,529,921.75
Option 3A Supply Fan Option:								
South Supply Fans 30,000 CFM	8	ea	1700	$ 13,600.00				$ 13,600.00
Underground Duct 80" Concrete	700	l.f.	200	$ 140,000.00				$ 140,000.00
Plenum Boxes	8	ea	1200	$ 9,600.00				$ 9,600.00
Duct Risers	8	allow	6000	$ 48,000.00				$ 48,000.00
Trench & Backfill	700	l.f.	35	$ 24,500.00				$ 24,500.00
Inlet Louvers	64	sq.ft.	50	$ 3,200.00				$ 3,200.00
Electrical Power for Fans	800	l.f.	10.67	$ 8,536.00				$ 8,536.00
Starters	8	ea	500	$ 4,000.00				$ 4,000.00
Total - OPTION 4A								
$ 2,781,357.75								