City of Portland, Maine – Building or Use Permit Application 389 Congress Street, 04101, Tel: (207) 874-8703, FAX: 874-8716

Location of Construction:	Owner:	Phone:
94 Primrose Ln	Kusso, Dennis	797-8266
Owner Address:	**Lessee/Buyer's Name:**	**Phone:** / **BusinessName:**
SAA		
Contractor Name: D.E. NEAL & SONS INC	**Address:** 54 Tenney Hill Rd., Raymond	**Phone:** 655-5077
Past Use:	Proposed Use:	**COST OF WORK:** $ 5,000 / **PERMIT FEE:** $ Waived
1-Family	Same	**FIRE DEPT.** ☐ Approved ☐ Denied / **INSPECTION:** Use Group: Type:
		Signature: / Signature:

Proposed Project Description:

Repair existing deck.

PEDESTRIAN ACTIVITIES DISTRICT (P.A.D.)

Action: Approved ☐ Approved with Conditions: ☐ Denied ☐

Signature: Date:

Permit Taken By: UB | Date Applied For: May 25, 1999

1. This permit application does not preclude the Applicant(s) from meeting applicable State and Federal rules.
2. Building permits do not include plumbing, septic or electrical work.
3. Building permits are void if work is not started within six (6) months of the date of issuance. False information may invalidate a building permit and stop all work..

PERMIT ISSUED
WITH REQUIREMENTS

CERTIFICATION

I hereby certify that I am the owner of record of the named property, or that the proposed work is authorized by the owner of record and that I have been authorized by the owner to make this application as his authorized agent and I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in the application is issued, I certify that the code official's authorized representative shall have the authority to enter all areas covered by such permit at any reasonable hour to enforce the provisions of the code(s) applicable to such permit

May 25, 1999

SIGNATURE OF APPLICANT | ADDRESS: | DATE: | PHONE:

RESPONSIBLE PERSON IN CHARGE OF WORK, TITLE | PHONE:

White–Permit Desk Green–Assessor's Canary–D.P.W. Pink–Public File Ivory Card–Inspector

Permit No: 990550

PERMIT ISSUED
Permit Issued:
JUN 2 1999
CITY OF PORTLAND

Zone: R-5 | **CBL:** 350-A-011

Zoning Approval:

Special Zone or Reviews:
- ☐ Shoreland
- ☐ Wetland
- ☐ Flood Zone
- ☐ Subdivision
- ☐ Site Plan maj ☐ minor ☐ mm ☐

Zoning Appeal
- ☐ Variance
- ☐ Miscellaneous
- ☐ Conditional Use
- ☐ Interpretation
- ☐ Approved
- ☐ Denied

Historic Preservation
- ☐ Not in District or Landmark
- ☐ Does Not Require Review
- ☐ Requires Review

Action:
- ☐ Appoved
- ☐ Approved with Conditions
- ☐ Denied

Date: 6/2/99

CEO DISTRICT 2

COMMENTS

6/8/99 Went to Site w/ P.S.H. Discussed Engineers Report & Repairs to be made w/ Contractor Present - went over HR Neal Proposals - Everybody present understands what has to be done ☑

8/6/99 Insp w/ PSH, Mr. Neal & Jim Russo - Structural work Complete - b/f open for Inspection - Work meets requirements as per proposal & Permit - ok to Close ☑

8/10/99 - work Completed per above - Case Closed ☑

94 Primrose Lane
350-B-11

Inspection Record

Type	Date
Foundation:	
Framing:	
Plumbing:	
Final:	
Other:	

BUILDING PERMIT REPORT

DATE: 29 May 99 ADDRESS: 94 Primrose Lane CBL: 350-E-011

REASON FOR PERMIT: Repair existing deck

BUILDING OWNER: Dennie Russo

PERMIT APPLICANT: /Contractor STearns Property Services

USE GROUP R-3 (deck) BOCA 1996 CONSTRUCTION TYPE 5B

CONDITION(S) OF APPROVAL

This permit is being issued with the understanding that the following conditions are met:

Approved with the following conditions: *1, *4, *13, *29, *32, *34, *35, *36

*1. This permit does not excuse the applicant from meeting applicable State and Federal rules and laws.
2. Before concrete for foundation is placed, approvals from the Development Review Coordinator and Inspection Services must be obtained. (A 24 hour notice is required prior to inspection)
3. Foundation drain shall be placed around the perimeter of a foundation that consists of gravel or crushed stone containing not more than 10 percent material that passes through a No. 4 sieve. The drain shall extend a minimum of 12 inches beyond the outside edge of the footing. The thickness shall be such that the bottom of the drain is not higher than the bottom of the base under the floor, and that the top of the drain is not less than 6 inches above the top of the footing. The top of the drain shall be covered with an approved filter membrane material. Where a drain tile or perforated pipe is used, the invert of the pipe or tile shall not be higher than the floor elevation. The top of joints or top of perforations shall be protected with an approved filter membrane material. The pipe or tile shall be placed on not less than 2" of gravel or crushed stone, and shall be covered with not less than 6" of the same material. Section 1813.5.2
4. Foundations anchors shall be a minimum of ½" in diameter, 7" into the foundation wall, minimum of 12" from corners of foundation and a maximum 6' o.c. between bolts. (Section 2305.17)
5. Waterproofing and damp proofing shall be done in accordance with Section 1813.0 of the building code.
6. Precaution must be taken to protect concrete from freezing. Section 1908.0
7. It is strongly recommended that a registered land surveyor check all foundation forms before concrete is placed. This is done to verify that the proper setbacks are maintained.
8. Private garages located beneath habitable rooms in occupancies in Use Group R-1, R-2, R-3 or I-1 shall be separated from adjacent interior spaces by fire partitions and floor/ceiling assembly which are constructed with not less than 1-hour fire resisting rating. Private garages attached side-by-side to rooms in the above occupancies shall be completely separated from the interior spaces and the attic area by means of ½ inch gypsum board or the equivalent applied to the garage means of ½ inch gypsum board or the equivalent applied to the garage side. (Chapter 4, Section 407.0 of the BOCA/1996)
9. All chimneys and vents shall be installed and maintained as per Chapter 12 of the City's Mechanical Code. (The BOCA National Mechanical Code/1993). Chapter 12 & NFPA 211
10. Sound transmission control in residential building shall be done in accordance with Chapter 12, Section 1214.0 of the City's Building Code.
X11. Guardrails & Handrails: A guardrail system is a system of building components located near the open sides of elevated walking surfaces for the purpose of minimizing the possibility of an accidental fall from the walking surface to the lower level. Minimum height all Use Groups 42", except Use Group R which is 36". In occupancies in Use Group A, B, H-4, I-1, I-2, M and R and public garages and open parking structures, open guards shall have balusters or be of solid material such that a sphere with a diameter of 4" cannot pass through any opening. Guards shall not have an ornamental pattern that would provide a ladder effect. (Handrails shall be a minimum of 3e4" but not more than 38". Use Group R-3 shall not be less than 30", but not more than 38".) Handrail grip size shall have a circular cross section with an outside diameter of at least 1 ¼" and not greater than 2". (Sections 1021 & 1022.0) - Handrails shall be on both sides of stairway. (Section 1014.7)
12. Headroom in habitable space is a minimum of 7'6". (Section 1204.0)
X13. Stair construction in **Use Group R-3 & R-4is a minimum of 10" tread and 7 ¾" maximum rise**. All other Use Group minimum 11" tread, 7" maximum rise. (Section 1014.0)
14. The minimum headroom in all parts of a stairway shall not be less than 80 inches. (6'8") 1014.4
15. Every sleeping room below the fourth story in buildings of Use Groups R and I-1 shall have at least one operable window or exterior door approved for emergency egress or rescue. The units must be operable from the inside without the use of special knowledge or separate tools. Where windows are provided as means of egress or rescue they shall have a sill height not more than 44 inches (1118mm) above the floor. All egress or rescue windows from sleeping rooms shall have a minimum net clear opening height dimension of 24 inches (610mm). The minimum net clear opening width dimension shall be 20 inches (508mm), and a minimum net clear opening of 5.7 sq. ft. (Section 1018.6)
16. Each apartment shall have access to two (2) separate, remote and approved means of egress. A single exit is acceptable when it exits directly from the apartment to the building exterior with no communications to other apartment units. (Section 1010.1)
17. All vertical openings shall be enclosed with construction having a fire rating of at least one (1) hour, including fire doors with self closer's. (Over 3 stories in height requirements for fire rating is two (2) hours.) (Section 710.0)

18. The boiler shall be protected by enclosing with (1)hour fire rated construction including fire doors and ceiling, or by providing automatic extinguishment. (Table 302.1.1)

19. All single and multiple station smoke detectors shall be of an approved type and shall be installed in accordance with the provisions of the City's Building Code Chapter 9, Section 920.3.2 (BOCA National Building Code/1996), and NFPA 101 Chapter 18 &19. (Smoke detectors shall be installed and maintained at the following locations):
    - In the immediate vicinity of bedrooms
    - In all bedrooms
    - In each story within a dwelling unit, including basements

    In addition to the required AC primary power source, required smoke detectors in occupancies in Use Groups R-2, R-3 and I-1 shall receive power from a battery when the AC primary power source is interrupted. (Interconnection is required) Section 920.3.2.

20. A portable fire extinguisher shall be located as per NFPA #10. They shall bear the label of an approved agency and be of an approved type. (Section 921.0)

21. The Fire Alarm System shall maintained to NFPA #72 Standard.

22. The Sprinkler System shall maintained to NFPA #13 Standard.

23. All exit signs, lights and means of egress lighting shall be done in accordance with Chapter 10 Section & Subsections 1023.0 & 1024.0 of the City's Building Code. (The BOCA National Building Code/1996)

24. Section 25-135 of the Municipal Code for the City of Portland states, "No person or utility shall be granted a permit to excavate or open any street or sidewalk from the time of November 15 of each year to April 15 of the following year".

25. The builder of a facility to which Section 4594-C of the Maine State Human Rights Act Title 5 MRSA refers, shall obtain a certification from a design professional that the plans commencing construction of the facility, the builder shall submit the certification the Division of Inspection Services.

26. Ventilation shall meet the requirements of Chapter 12 Sections 1210.0 of the City's Building Code. (Crawl spaces & attics).

27. All electrical, plumbing and HVAC permits must be obtained by a Master Licensed holders of their trade. **No closing in of walls until all electrical** (min. 72 hours notice) **and plumbing inspections have been done.**

28. All requirements must be met before a final Certificate of Occupancy is issued.

X 29. All building elements shall meet the fastening schedule as per Table 2305.2 of the City's Building Code (the BOCA National Building Code/1996).

30. Ventilation of spaces within a building shall be done in accordance with the City's Mechanical Code (The BOCA National Mechanical Code/1993). (Chapter M-16)

31. Please read and implement the attached Land Use Zoning report requirements.

X 32. Boring, cutting and notching shall be done in accordance with Sections 2305.4.4, 2305.5.1 and 2305.5.3 of the City's Building Code.

33. Glass and glazing shall meet the requirements of Chapter 24 of the building code.

X 34. All requirement set forth in Mr. David A. Price, PE letter to Mr. Russo must be met - letter dated April 9 1999.

X 35. Maximum span of 2"x8" at 16" on center is 12'-

X 36. Where protection of wood members is required because of exposure to soil or weather protection shall be provided by using naturally durable or preservative-treated wood.

P. Samuel Hoffses, Building Inspector
cc: Lt. McDougall, PFD
Marge Schmuckal, Zoning Administrator

PSH 12-14-98

**On the basis of plans submitted and conditions placed on these plans any deviations shall require a separate approval.

TABLE OF CONTENTS

1.0 INTRODUCTION

At your request, a visual review of the exterior wooden deck behind the residence at 94 Primrose Lane was performed on June 22, 1998. The purpose of the inspection and report is to evaluate the structural adequacy of the wooden deck currently under construction. The inspection was performed by and this report written by David A. Price, P.E. Also present at the time of inspection was Dennis Russo, the owner of the residence, and Ed Murray, the contractor overseeing construction.

This evaluation is based on visible evidence observed at the time of the inspection. No disassembly of components or testing was performed. Although this report makes reference to the BOCA Building Code, the scope of this inspection does not include a comprehensive evaluation for code compliance, government regulation compliance, or hazardous materials in or around this building. It is our responsibility to evaluate conditions relevant to the purpose of the inspection. We are not, however, responsible for the conditions that could not be seen or were not within the scope of our services at the time of the inspection. This report is not to be considered a guarantee of condition and no warranty is implied.

For purposes of this report, all directions (left, right, rear, etc.) are taken from the viewpoint of an observer standing in front of the building and facing it.

2.0 DESCRIPTION

The wooden deck is adjacent to the right side of an existing swimming pool in the back of the residence. The size of the deck is approximately 22 feet by 35 feet and is currently under construction. Most of the materials observed appeared to be pressure treated wood and the top of the deck is at the same elevation as the top of concrete adjacent to the pool. The timber framing is supported by 8 inch diameter concrete piers (sonotubes) and it is my understanding the concrete piers extend to more than 4 feet below the existing grade.

A small wood retaining wall extends around the perimeter of both the pool and the deck. The wall supports a sloping embankment and the wall is currently out-of-plumb.

3.0 OBSERVATIONS

When I arrived on site, much of the construction had already been performed and many of the construction materials could not be observed. However, the owner did provide a series of photographs which indicated previous stages of construction and several items were noted based on these photographs. One is at a location where a double 2x8 beam encountered a large rock. The 2x8 was notched severely to such an extent that only 2 inches in depth of the 2x8 beam was actually bearing on the rock. The owner indicated this was done since the contractor said the rock could not be removed. At another location, a photograph showed that the concrete pier (sonotube) on which the primary-framing was to be supported was too low and a series of 8"x8"x1½" thick wood shims was placed on top of the

sonotube to support the primary framing. The owner indicated it was his understanding that there was no connection uniting the primary framing to the series of shims. The owner mentioned that none of the framing was mechanically fastened to the top of the sonotubes at the areas which were already covered with deck. The total depth of the shims appeared to be approximately 4½ inches. based on the photograph.

At several locations it appeared from the photos that the framing for the deck was nearly or completely off of the sonotube bearing support. The owner indicated that the material in which the builder had to work appeared to be a very stiff clay, making installation of the sonotubes very difficult. On June 24, I spoke with Kevin Carol, Portland Building Inspection Office, and Kevin indicated that he had personally visited the site and could confirm that the sonotubes did extend more than 4 feet below the top of the existing grade.

After discussing with the owner, I went to the back yard and began taking a series of field notes. I noted that the posts along the right side of the deck are approximately 8 to 11 feet on center and the distance between the top of the deck and the top of the sonotube varies between approximately 4 feet and 5 feet. There was no diagonal bracing between the posts to prevent racking of the structure. It was also apparent that several of these posts were partially off the top of the sonotube, some by approximately an inch or so. Furthermore, I did not see any mechanical connection between the top of the sonotube and the wooden posts.

The vast majority of materials being installed were all pressure treated. The only items which did not appear to be pressure treated were several of the components to a small retaining wall which extends around the perimeter of the building. At several areas it was noted that both the posts and the lumber extending between the posts were not pressure treated.

There are several levels of the deck, the highest level being adjacent to the house from which a series of four steps extends down to the large main deck adjacent to the pool. The height of the top riser was approximately 3 inches, the height of the next two risers of these steps was 7 inches, and the height of the bottom riser was 8 inches. The framing supporting this higher deck appeared to be 2x8s at 16 inches on center. However, due to exterior coverings on the sides of the completed portion of this deck, access was limited. The joists were supported with joist hangers to primary beam members which were in turn supported by 4x4 posts at relatively close spacing (approximately 5 feet on center). The span of the 2x8 joists was approximately 10½ feet.

On the larger lower portion of the deck, the posts along the right side of the deck varied in spacing between 11.2 feet on center and 7.5 feet on center. Extending between the posts was the "primary beam" consisting of a single 2x8. The primary beam provided support for the ends of the existing joists. The 2x8 beam was face-nailed to the posts with what appeared to be 16d galvanized nails. In some locations the beam was fastened to the

post with three nails. At other locations, there were as many as eight nails. At one location. the primary beam did not fasten directly to the post. Instead, there was a splice located approximately 1 foot away from the post connecting one primary beam to the other. The splice consisted of a short 2x8 splice plate in which the 2x8 beams were fastened to the 2x8 splice plate with six nails on each side.

The joist framing for the large deck consisted of 2x8 pressure treated lumber at 16 inches on center and no bridging was observed. Joist hangers were not observed but instead the joists were connected to the primary beam with three galvanized 16d nails. At one location the length of the nail did not penetrate into a joist. For this reason, I was able to measure the length of the nail being 3½ inches. This appeared to be a common nail as opposed to a box nail. The joists along the right side of the deck spanned approximately 12½ feet.

The primary beam supporting the joists at the center of the deck running from front to back appeared to be a double 2x8 pressure treated beam. This could only be observed from a distance due to limited access. Only the end of the beam nearest the house could be observed and it was supported by a short post underneath the higher deck. The majority of the length of the beam could not be observed because it appeared to be virtually buried in the supporting soil underneath the deck.

The soil adjacent to the pool and underneath the deck varied in elevation. Closest to the pool it appears that the wood deck was built virtually right on grade and that the soil was very close to the bottom of the deck surface. Again, this area could not be observed directly. The soil slopes gradually to the right side and to the back of the deck whereupon a steep slope occurs and the change in elevation between the high point of the grade to the top of the retaining wall is approximately 3 feet.

The retaining wall itself is approximately 28 inches tall and consists of 6x6 post timbers at approximately 8 feet on center. These are cast into a 12 inch diameter sonotube. It is not known how far the post extends into the sonotube. At locations where construction appeared to be done recently, the posts were pressure treated. The retaining wall itself consisted of 2x8 horizontal members spanning between the 6x6 posts. At virtually all locations, it appeared that the posts were out-of-plumb due to the force of the soil bearing against the retaining wall.

At two locations the 2x8 members extending between the posts for the retaining wall did not bear directly on the 6x6 post. Rather, it stopped short and because of this, a 2x6 "scab" was nailed to the side of the 6x6 post whereupon the 2x8 was nailed to this scab piece. At one location the anchorage between the 2x6 and the 6x6 was holding firm; at a second location the 2x6 scab was clearly being dislodged from the 6x6 due to the force of the retaining wall. OK - Complete

It appeared that at least some of the concrete used for the project was mixed on site in that empty Sacrete bags could be seen at various locations on the project site. The owner indicated that some of the sonotubes were in fact placed with concrete obtained from a ready mix supplier. It is not known what the strength of the concrete is within the sonotubes, but at some locations the tops of some of the sonotubes were chipped.

4.0 EVALUATION

At the location where the primary beam is notched to go over the rock (evident from the photograph), the beam appears to bear on both the rock and the soil. Therefore, as the soil settles, the only area providing support for the beam will be the 2 inch portion of the beam supported by the rock. The concern is that once the beam is being supported at this 2 inch deep location, a shear crack can begin to propagate within the beam itself. Therefore, if the rock cannot be removed, then additional support should be provided for the beam on either side of the rock by installing two additional sonotubes, one on either side of the rock. An alternative method may be to use some type of a fabricated steel strap which is capable of transmitting the load over the rock and distributing it properly to each side of the wood beam. The steel strap should be galvanized and bolted to the wood beam extending for at least 3 feet beyond the notched location. The steel strap should furthermore be applied to both sides of the wood beam.

With regard to the posts and shims not being mechanically fastened to the sonotubes (or at other locations the joists and beams not being fastened to sonotubes), there is a concern that due to residual lateral forces which are imposed on the wood frame structure, there is no mechanical means of transferring these lateral loads to the foundation. Currently, the structure is simply relying on friction between the wood post and the sonotube. In other words, typically we recommend that a post base metal connector be installed between each sonotube and each post. This ensures that the post will remain engaged with the sonotube foundation and not slide off. In addition, at each location where the timber frame bears on a sonotube, there again should be mechanical connection bolting the frame members to the sonotube. At locations where posts or frame members are only partially supported by the sonotube, there is a concern that frost heave may actually lift the frame or the post if it is able to get underneath the wood members. For this reason, posts and framing should bear completely on sonotubes and as indicated earlier, should be mechanically fastened to the sonotubes. In addition, the wood structure should not be in contact with the soil but should be supported only by the sonotubes.

At the locations where posts occur along the right side and the back of the deck, there should be bracing between the posts to provide lateral stability for the deck structure. In other words, the deck should be constructed in such a fashion that potential for racking of the deck structure will not occur. This can be accomplished with a series of knee braces between the posts or diagonal elements from the base of one post to the top of the next.

Currently the City of Portland has adopted the 1996 edition of the BOCA National Building Code. This code indicates that there are tolerances for items such as dimensional uniformity of stair risers. The steps between the high deck and the low deck exceed these tolerances. The maximum difference in height of risers within a set of stairs or steps cannot exceed ±3/16 inch.

The code also goes on to indicate that at locations where joist depth to thickness ratio exceeds 6 to 1, bridging shall be installed. However, because the joist framing consists of 2x8s, this depth to thickness ratio is not exceeded and therefore bridging would not be required. It appears that the capacity of the joists and the capacity of the three nails fastening the joists to the primary beam are adequate to support the required live load for the deck. This is based on the code requirement that the required live load for the deck is 40 psf, the same as that required for the internal portions of the residence itself.

The capacity of the 2x8 beam that supports the joists, however, is well below that required to satisfy code requirements. This is particularly the case where the beam extends approximately 11'-3" between supports. The maximum permitted span for a single 2x8 beam supporting joists which are approximately 12½ feet long would be 4 feet. In other words, the 2x8 beam could be used if additional supports were placed at 4 feet on center. As an alternative, if the beam were replaced by a 4x12 beam, then it could span the 11'-3" span that currently exists.

The beam-to-post connection is clearly inadequate and I recommend that a 2x4 be applied directly underneath the beam in such a manner that it extends all the way from the beam down to the sonotube, thereby providing direct support underneath the beam to the sonotube and not relying on the nails to transfer the loads between the beam and the posts.

The splice detail between the beam clearly does not satisfy code requirements and the beam at this location needs to be replaced so that it extends completely from the center line of one post to the center line of the next. This splice details occurs on the right hand side of the deck at the second post from the front.

With regard to the concrete quality, this could not be determined from observations. However, since the loads are essentially such that it places the concrete in compression, the primary concern of the concrete is that it will not deteriorate over time. With regard to strength, even with a very low strength concrete, the sonotubes should be capable of adequately supporting the deck framing provided the concrete stays intact. Placing a wood post inside a concrete sonotube typically is not recommended since the thin portions of concrete around the post can crack and eventually break apart.

With regard to the retaining wall, the primary concern is the stability of the retaining wall itself. Clearly, it appears that the retaining wall is overloaded under the present conditions by the fact that the retaining wall is tilted outward due to the force of the soil behind the wall. The concern is that if the wall is tilted, based on the loads it has undergone

thus far, it will continue to rotate until ultimately it collapses. Therefore, the owner should be aware that either replacement or major reinforcement of the wall will likely need to take place in the near future. If the wall is permitted to continue to rotate, then eventually the soil behind it will continue to move. The fact that portions of the frame and the sonotubes are embedded within the soil then implies that if the soil moves, the frame itself will be in jeopardy. Therefore, the retaining wall is a very important part of the structural integrity of the deck itself and the retaining wall needs to be stable.

With regard to the framing pieces being embedded in the soil, typically we recommend that there be a minimum of a 2 inch air space around all wood members, even those that are pressure treated because of the capability of frost heave to physically lift the timber if it is in direct contact underneath the timber members. As stated earlier, the frame should bear only on concrete sonotubes extending below frost. At ~~the locations where there is a 2x6 scab applied to the 6x6 posts of the retaining walls, these areas should be corrected immed~~iately so that the 2x8 retaining ~~wall members bear directly on the 6x6 post~~s. The portions of the retaining wall which are not pressure treated should be replaced with pressure treated lumber.

Overall, there is a concern with regard to the soil stability. Therefore, a long term consideration with the deck as it is designed and laid out is whether or not the deck will remain level throughout the years. Although this is not a structural safety concern, the owner should be aware that over a period of time, and it is not known how long, the deck itself may undergo changes in elevation so that the deck is not level. The primary safety concern is that if the deck does not remain level, a tripping hazard may develop.

5.0 RECOMMENDATIONS

At locations where the primary beam framing is notched over a rock location, I recommend that this area be reopened and that the beam be properly supported either by additional sonotubes or by a galvanized set of steel straps.

At each location where the framing or posts bear on the sonotubes, there should be a bolted mechanical connection between the framing and the concrete. The stack of shims should be replaced by a single pressure treated post anchored securely to both the frame and the sonotube. This can be done through the use of an epoxy anchor bolt within the concrete. I do not recommend that an expansion bolt be used since it induces lateral forces within the concrete and may cause splitting or cracking of the concrete.

At locations where posts or framing members are off to the sides of the sonotubes, the posts and framing should be adjusted so that they bear completely on top of the concrete sonotubes with no portion of the wood extending over the side. Furthermore, I recommend that at all locations the soil elevation be lowered to a minimum of 2 inches below the top of the sonotube. Furthermore, a minimum of 2 inches of air space should exist below the

bottom of framing members to prevent the potential of frost heaving the framing. Slope all portions of soil to drain (¼"/ft.) so no pockets occur where water can collect.

I also recommend that along the right side of the deck there be diagonal bracing extending from the bottom of the posts up to the top of adjacent posts to provide lateral stability for the frame. This should also take place at the back of the deck.

The 2x8 beams along the right side of the deck (supporting the joists) clearly need to be upgraded so that proper support is provided. Either the beams should be increased in size or additional support should be provided. The connection between the beams and the posts needs to be revised so that the beam is bearing directly on timber framing as opposed to being face-nailed into the sides of the posts.

The riser distance at all steps should be modified so that they are consistent as required by code.

As indicated in the evaluation portion of the report, the retaining wall will eventually need to be substantially reinforced or replaced to support the lateral soil loads.

6.0 CONCLUSION

In conclusion, it appears that with regard to safety there are a series of items which can and should be implemented immediately. As noted in the report, additional reinforcement or replacement of the retaining wall should be anticipated in the near future.

These recommendations are based upon visual evidence available at the time of the inspection. If you have questions regarding this report or if I can be of further service in this matter, please do not hesitate to call me.

Sincerely,

David A. Price, P.E.
Director of Engineering

DAP/ja
cc: Steven H. Kommel

j:\wpdocs\project\proj98\russo.rep

STATE OF MAINE
DAVID
A.
PRICE
#6401
REGISTERED
PROFESSIONAL ENGINEER

CRITERIUM MOONEY ENGINEERS

650 BRIGHTON AVENUE
PORTLAND ME 04102
TEL 207 775-1969
TOLL FREE 1 800 922-1969
FAX 207 775-4405

April 9, 1999

Mr. Dennis Russo
94 Primrose Lane
Portland, ME 04103

Re: Review of Exterior Wood Deck Improvements
94 Primrose Lane, Portland, Maine
CME Project No. 99-060

Dear Dennis:

At your request, I performed a second visual review of the exterior wooden deck behind the residence at 94 Primrose Lane on March 31, 1999. This was a follow up to the original review I performed last summer and subsequent report dated June 24, 1998. In that report, a series of recommendations were provided indicating alterations that your contractor should perform to improve the structural adequacy of the wooden deck which was under construction at that time. It is my understanding that the contractor has indicated to you that he has completed those items listed in the original report and it is for this reason that you have asked me to look at the structure again to confirm whether or not the work complies with those recommendations.

As before, please note that the comments made within this letter are based on visible evidence observed at the time of the site visit. No disassembly of components or testing was performed and this review does not include a comprehensive evaluation for code compliance. This letter will not address conditions that could not be seen or were not within the scope of our services at the time of the site visit. Furthermore, this letter should not be considered a guarantee of condition, and no warranty is implied.

It should be noted that at the time the previous site was made last summer access was limited such that only the perimeter of the wooden deck could be examined. During this more recent site visit, however, some of the planking had been removed and the structural framing adjacent to the concrete pool patio could be observed directly.

The summary of the recommendations made previously and the current condition which I observed during the most recent site visit is as follows:

1. *Previous Recommendation:* Install galvanized steel straps such that they extend 3 feet beyond each side of locations where beams had been notched. Told contractor this

   Current Condition: Steel straps were installed; however, the strap only extends 12 inches beyond the location where the beam had been notched.

2. *Previous Recommendation:* Anchor the base of the timber posts to the top of the concrete sonotubes with epoxy anchor bolts so that the concrete does not split or crack. Told about this

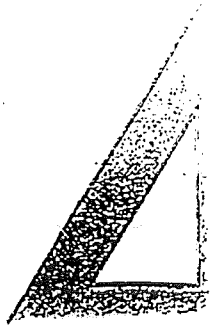
   Current Condition: The steel straps have been installed connecting the posts to the concrete sonotubes using nails, and the impact of the nails has cracked and caused splitting of the concrete at many locations thereby severely compromising the connection.

3. *Previous Recommendation:* Relocate wooden posts so that the posts are bearing completely on the top of the concrete sonotube surface without having portions of the wooden posts protruding off the side of the concrete. Told about this.

   Current Condition: The posts do not bear completely on the concrete (on at least four locations) and protrude off to the side as was originally the situation last summer.

4. *Previous Recommendation:* I recommended that the soil level be lowered at all locations to a point which was at least 2 inches below the top of the concrete sonotube.

   Current Condition: The soil was not 2 inches below the top of the concrete sonotube at seven sonotube locations.



5. *Previous Recommendation:* I recommended a minimum of 2 inches of air space between the bottom of all wooden components and the top of finished soil grade. Furthermore, all portions of the soil surface should be sloped with a minimum 1/4-inch per foot slope to provide adequate drainage underneath the deck. This slope is important so that surface water would not collect in low spots. Told all wood must be protected when exposed to earth or weather — Section 2311.0.

Current Condition: There are still numerous locations where the framing is sitting in direct contact with the soil. Clearly, there is no drainage slope for the surface water to escape. Essentially, much of the framing sits in a trench filled with water each time it rains.

6. *Previous Recommendation:* I recommended that on the right side of the deck that diagonal bracing be installed. Told above That.

Current Condition: Bracing appears to be adequately installed.

7. *Previous Recommendation:* Perimeter beams supporting decking joists should be increased in size to either 4x12 beams or additional posts and sonotubes should be installed so that the beam is supported at 4 feet on center. Told To increase size.

Current Condition: A single 2x8 was anchored to the face of the existing 2x8 beam, and one additional post was installed. This is still structurally inadequate.

8. *Previous Recommendation:* The perimeter beam should be bearing directly on timber posts underneath instead of being face-nailed to the sides of the post. Told about This.

Current Condition: The existing beam appears to have adequate bearing underneath; however, the new 2x8 applied does not.

9. *Previous Recommendation:* The riser distance at all steps should be modified so that they are consistent. Told about this.

   Current Condition: It appears that this condition has been significantly improved.

10. *Previous Recommendation:* The existing retaining wall should either be reinforced or replaced.

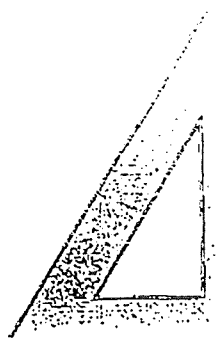
    Current Condition: Although some effort appears to have been made, Mr. Russo pointed out one location where a post, which was still leaning severely, had not been addressed.

As I indicated to Mr. Russo during the second site visit, I am very concerned that the recommendations I made last summer have not been adequately addressed. In fact, the situation appears to be worse now that I have had a chance to actually see portions of the framing in contact with the dirt.

A proper structure should have timber with adequate ventilation around it so that not only can the timber remain dry but also the timber can be resting on a foundation which extends below frost. This structure, however, has beams and framing sitting in the dirt, pockets of poorly graded soil where water collects, inadequate anchorage between the framing and the concrete, and the tops of the concrete sonotubes compromised due to cracking.

In addition, the sides of the existing concrete slab on grade patio around the pool appeared to be severely undermined because of the poor construction of the timber deck adjacent to the concrete. Indeed, one of the concrete slabs has settled severely and will likely need to be replaced.

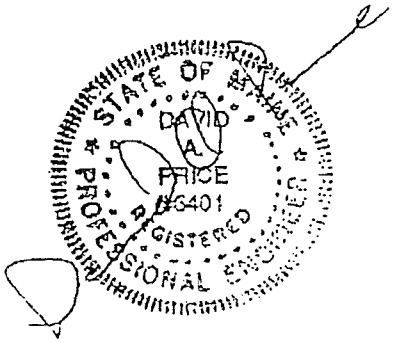
Other problems also noted during the inspection included the areas which Mr. Russo pointed out to me where both the joists and a portion of the 2x8 beams had been severely split. This deck is supposed to brand-new construction. All installed materials should be sound, and any members which are split should be completely replaced with brand-new materials.



At this point, I recommend getting in touch with a competent contractor who can provide recommendations as far as how to best use your existing materials. During that conversation, he may be able to ascertain whether it makes more economical sense to make repairs to the existing deck or simply to remove the existing materials, clean the nails from the lumber, install new sonotubes and use the existing timber components as much as possible. This would ensure that you have a deck that is relatively structurally free from future problems and would also make it possible for the interface between the concrete patio and the wooden deck to be constructed in such a matter that undermining is no longer a concern.

These comments are based upon visual observations made at the time of the site visit. If you have questions regarding this letter or if I can be of further service in this matter, please do not hesitate to call me.

Sincerely,



David A. Price, P.E.
Director of Engineering

DAP/sh

j:\wpdocs\project\proj99\russo.ltr

STRUCTURAL REVIEW OF EXTERIOR WOODEN DECK

94 Primrose Lane
Portland, Maine

Prepared for:

Dennis Russo
94 Primrose Lane
Portland, ME 04103

Prepared by:

Criterium - Mooney Engineers
650 Brighton Avenue
Portland, ME 04102
[207] 775-1969

June 24, 1998

Project No. 98-112
Date of Inspection: June 22, 1998
Engineer: David A. Price, P.E.

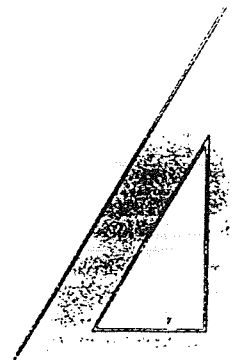
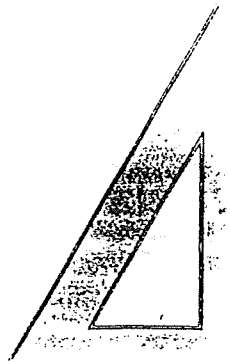


TABLE OF CONTENTS



1.0 INTRODUCTION

At your request, a visual review of the exterior wooden deck behind the residence at 94 Primrose Lane was performed on June 22, 1998. The purpose of the inspection and report is to evaluate the structural adequacy of the wooden deck currently under construction. The inspection was performed by and this report written by David A. Price, P.E. Also present at the time of inspection was Dennis Russo, the owner of the residence, and Ed Murray, the contractor overseeing construction.

This evaluation is based on visible evidence observed at the time of the inspection. No disassembly of components or testing was performed. Although this report makes reference to the BOCA Building Code, the scope of this inspection does not include a comprehensive evaluation for code compliance, government regulation compliance, or hazardous materials in or around this building. It is our responsibility to evaluate conditions relevant to the purpose of the inspection. We are not, however, responsible for the conditions that could not be seen or were not within the scope of our services at the time of the inspection. This report is not to be considered a guarantee of condition and no warranty is implied.

For purposes of this report, all directions (left, right, rear, etc.) are taken from the viewpoint of an observer standing in front of the building and facing it.

2.0 DESCRIPTION

The wooden deck is adjacent to the right side of an existing swimming pool in the back of the residence. The size of the deck is approximately 22 feet by 35 feet and is currently under construction. Most of the materials observed appeared to be pressure treated wood and the top of the deck is at the same elevation as the top of concrete adjacent to the pool. The timber framing is supported by 8 inch diameter concrete piers (sonotubes) and it is my understanding the concrete piers extend to more than 4 feet below the existing grade.

A small wood retaining wall extends around the perimeter of both the pool and the deck. The wall supports a sloping embankment and the wall is currently out-of-plumb.

3.0 OBSERVATIONS

When I arrived on site, much of the construction had already been performed and many of the construction materials could not be observed. However, the owner did provide a series of photographs which indicated previous stages of construction and several items were noted based on these photographs. One is at a location where a double 2x8 beam encountered a large rock. The 2x8 was notched severely to such an extent that only 2 inches in depth of the 2x8 beam was actually bearing on the rock. The owner indicated this was done since the contractor said the rock could not be removed. At another location, a photograph showed that the concrete pier (sonotube) on which the primary framing was to be supported was too low and a series of 8"x8"x1½" thick wood shims was placed on top of the

sonotube to support the primary framing. The owner indicated it was his understanding that there was no connection uniting the primary framing to the series of shims. The owner mentioned that none of the framing was mechanically fastened to the top of the sonotubes at the areas which were already covered with deck. The total depth of the shims appeared to be approximately 4½ inches. based on the photograph.

At several locations it appeared from the photos that the framing for the deck was nearly or completely off of the sonotube bearing support. The owner indicated that the material in which the builder had to work appeared to be a very stiff clay, making installation of the sonotubes very difficult. On June 24, I spoke with Kevin Carol, Portland Building Inspection Office, and Kevin indicated that he had personally visited the site and could confirm that the sonotubes did extend more than 4 feet below the top of the existing grade.

After discussing with the owner, I went to the back yard and began taking a series of field notes. I noted that the posts along the right side of the deck are approximately 8 to 11 feet on center and the distance between the top of the deck and the top of the sonotube varies between approximately 4 feet and 5 feet. There was no diagonal bracing between the posts to prevent racking of the structure. It was also apparent that several of these posts were partially off the top of the sonotube, some by approximately an inch or so. Furthermore, I did not see any mechanical connection between the top of the sonotube and the wooden posts.

The vast majority of materials being installed were all pressure treated. The only items which did not appear to be pressure treated were several of the components to a small retaining wall which extends around the perimeter of the building. At several areas it was noted that both the posts and the lumber extending between the posts were not pressure treated.

There are several levels of the deck, the highest level being adjacent to the house from which a series of four steps extends down to the large main deck adjacent to the pool. The height of the top riser was approximately 3 inches, the height of the next two risers of these steps was 7 inches, and the height of the bottom riser was 8 inches. The framing supporting this higher deck appeared to be 2x8s at 16 inches on center. However, due to exterior coverings on the sides of the completed portion of this deck, access was limited. The joists were supported with joist hangers to primary beam members which were in turn supported by 4x4 posts at relatively close spacing (approximately 5 feet on center). The span of the 2x8 joists was approximately 10½ feet.

On the larger lower portion of the deck, the posts along the right side of the deck varied in spacing between 11.2 feet on center and 7.5 feet on center. Extending between the posts was the "primary beam" consisting of a single 2x8. The primary beam provided support for the ends of the existing joists. The 2x8 beam was face-nailed to the posts with what appeared to be 16d galvanized nails. In some locations the beam was fastened to the

post with three nails. At other locations, there were as many as eight nails. At one location. the primary beam did not fasten directly to the post. Instead, there was a splice located approximately 1 foot away from the post connecting one primary beam to the other. The splice consisted of a short 2x8 splice plate in which the 2x8 beams were fastened to the 2x8 splice plate with six nails on each side.

The joist framing for the large deck consisted of 2x8 pressure treated lumber at 16 inches on center and no bridging was observed. Joist hangers were not observed but instead the joists were connected to the primary beam with three galvanized 16d nails. At one location the length of the nail did not penetrate into a joist. For this reason, I was able to measure the length of the nail being 3½ inches. This appeared to be a common nail as opposed to a box nail. The joists along the right side of the deck spanned approximately 12½ feet.

The primary beam supporting the joists at the center of the deck running from front to back appeared to be a double 2x8 pressure treated beam. This could only be observed from a distance due to limited access. Only the end of the beam nearest the house could be observed and it was supported by a short post underneath the higher deck. The majority of the length of the beam could not be observed because it appeared to be virtually buried in the supporting soil underneath the deck.

The soil adjacent to the pool and underneath the deck varied in elevation. Closest to the pool it appears that the wood deck was built virtually right on grade and that the soil was very close to the bottom of the deck surface. Again, this area could not be observed directly. The soil slopes gradually to the right side and to the back of the deck whereupon a steep slope occurs and the change in elevation between the high point of the grade to the top of the retaining wall is approximately 3 feet.

The retaining wall itself is approximately 28 inches tall and consists of 6x6 post timbers at approximately 8 feet on center. These are cast into a 12 inch diameter sonotube. It is not known how far the post extends into the sonotube. At locations where construction appeared to be done recently, the posts were pressure treated. The retaining wall itself consisted of 2x8 horizontal members spanning between the 6x6 posts. At virtually all locations, it appeared that the posts were out-of-plumb due to the force of the soil bearing against the retaining wall.

At two locations the 2x8 members extending between the posts for the retaining wall did not bear directly on the 6x6 post. Rather, it stopped short and because of this, a 2x6 "scab" was nailed to the side of the 6x6 post whereupon the 2x8 was nailed to this scab piece. At one location the anchorage between the 2x6 and the 6x6 was holding firm; at a second location the 2x6 scab was clearly being dislodged from the 6x6 due to the force of the retaining wall. OK - Complete

It appeared that at least some of the concrete used for the project was mixed on site in that empty Sacrete bags could be seen at various locations on the project site. The owner indicated that some of the sonotubes were in fact placed with concrete obtained from a ready mix supplier. It is not known what the strength of the concrete is within the sonotubes, but at some locations the tops of some of the sonotubes were chipped.

4.0 EVALUATION

At the location where the primary beam is notched to go over the rock (evident from the photograph), the beam appears to bear on both the rock and the soil. Therefore, as the soil settles, the only area providing support for the beam will be the 2 inch portion of the beam supported by the rock. The concern is that once the beam is being supported at this 2 inch deep location, a shear crack can begin to propagate within the beam itself. Therefore, if the rock cannot be removed, then additional support should be provided for the beam on either side of the rock by installing two additional sonotubes, one on either side of the rock. An alternative method may be to use some type of a fabricated steel strap which is capable of transmitting the load over the rock and distributing it properly to each side of the wood beam. The steel strap should be galvanized and bolted to the wood beam extending for at least 3 feet beyond the notched location. The steel strap should furthermore be applied to both sides of the wood beam.

With regard to the posts and shims not being mechanically fastened to the sonotubes (or at other locations the joists and beams not being fastened to sonotubes), there is a concern that due to residual lateral forces which are imposed on the wood frame structure, there is no mechanical means of transferring these lateral loads to the foundation. Currently, the structure is simply relying on friction between the wood post and the sonotube. In other words, typically we recommend that a post base metal connector be installed between each sonotube and each post. This ensures that the post will remain engaged with the sonotube foundation and not slide off. In addition, at each location where the timber frame bears on a sonotube, there again should be mechanical connection bolting the frame members to the sonotube. At locations where posts or frame members are only partially supported by the sonotube, there is a concern that frost heave may actually lift the frame or the post if it is able to get underneath the wood members. For this reason, posts and framing should bear completely on sonotubes and as indicated earlier, should be mechanically fastened to the sonotubes. In addition, the wood structure should not be in contact with the soil but should be supported only by the sonotubes.

At the locations where posts occur along the right side and the back of the deck, there should be bracing between the posts to provide lateral stability for the deck structure. In other words, the deck should be constructed in such a fashion that potential for racking of the deck structure will not occur. This can be accomplished with a series of knee braces between the posts or diagonal elements from the base of one post to the top of the next.

Currently the City of Portland has adopted the 1996 edition of the BOCA National Building Code. This code indicates that there are tolerances for items such as dimensional uniformity of stair risers. The steps between the high deck and the low deck exceed these tolerances. The maximum difference in height of risers within a set of stairs or steps cannot exceed $\pm 3/16$ inch.

The code also goes on to indicate that at locations where joist depth to thickness ratio exceeds 6 to 1, bridging shall be installed. However, because the joist framing consists of 2x8s, this depth to thickness ratio is not exceeded and therefore bridging would not be required. It appears that the capacity of the joists and the capacity of the three nails fastening the joists to the primary beam are adequate to support the required live load for the deck. This is based on the code requirement that the required live load for the deck is 40 psf, the same as that required for the internal portions of the residence itself.

The capacity of the 2x8 beam that supports the joists, however, is well below that required to satisfy code requirements. This is particularly the case where the beam extends approximately 11'-3" between supports. The maximum permitted span for a single 2x8 beam supporting joists which are approximately 12½ feet long would be 4 feet. In other words, the 2x8 beam could be used if additional supports were placed at 4 feet on center. As an alternative, if the beam were replaced by a 4x12 beam, then it could span the 11'-3" span that currently exists.

The beam-to-post connection is clearly inadequate and I recommend that a 2x4 be applied directly underneath the beam in such a manner that it extends all the way from the beam down to the sonotube, thereby providing direct support underneath the beam to the sonotube and not relying on the nails to transfer the loads between the beam and the posts.

The splice detail between the beam clearly does not satisfy code requirements and the beam at this location needs to be replaced so that it extends completely from the center line of one post to the center line of the next. This splice details occurs on the right hand side of the deck at the second post from the front.

With regard to the concrete quality, this could not be determined from observations. However, since the loads are essentially such that it places the concrete in compression, the primary concern of the concrete is that it will not deteriorate over time. With regard to strength, even with a very low strength concrete, the sonotubes should be capable of adequately supporting the deck framing provided the concrete stays intact. Placing a wood post inside a concrete sonotube typically is not recommended since the thin portions of concrete around the post can crack and eventually break apart.

With regard to the retaining wall, the primary concern is the stability of the retaining wall itself. Clearly, it appears that the retaining wall is overloaded under the present conditions by the fact that the retaining wall is tilted outward due to the force of the soil behind the wall. The concern is that if the wall is tilted, based on the loads it has undergone

thus far, it will continue to rotate until ultimately it collapses. Therefore, the owner should be aware that either replacement or major reinforcement of the wall will likely need to take place in the near future. If the wall is permitted to continue to rotate, then eventually the soil behind it will continue to move. The fact that portions of the frame and the sonotubes are embedded within the soil then implies that if the soil moves, the frame itself will be in jeopardy. Therefore, the retaining wall is a very important part of the structural integrity of the deck itself and the retaining wall needs to be stable.

With regard to the framing pieces being embedded in the soil, typically we recommend that there be a minimum of a 2 inch air space around all wood members, even those that are pressure treated because of the capability of frost heave to physically lift the timber if it is in direct contact underneath the timber members. As stated earlier, the frame should bear only on concrete sonotubes extending below frost. At ~~the locations where there is a 2x6~~ scab applied to the 6x6 posts of the retaining walls, ~~these areas should be corrected immedi~~ately so that the 2x8 retaining ~~wall members bear directly on the 6x6 post~~s. The portions of the retaining wall which are not pressure treated should be replaced with pressure treated lumber.

Overall, there is a concern with regard to the soil stability. Therefore, a long term consideration with the deck as it is designed and laid out is whether or not the deck will remain level throughout the years. Although this is not a structural safety concern, the owner should be aware that over a period of time, and it is not known how long, the deck itself may undergo changes in elevation so that the deck is not level. The primary safety concern is that if the deck does not remain level, a tripping hazard may develop.

5.0 RECOMMENDATIONS

At locations where the primary beam framing is notched over a rock location, I recommend that this area be reopened and that the beam be properly supported either by additional sonotubes or by a galvanized set of steel straps.

At each location where the framing or posts bear on the sonotubes, there should be a bolted mechanical connection between the framing and the concrete. The stack of shims should be replaced by a single pressure treated post anchored securely to both the frame and the sonotube. This can be done through the use of an epoxy anchor bolt within the concrete. I do not recommend that an expansion bolt be used since it induces lateral forces within the concrete and may cause splitting or cracking of the concrete.

At locations where posts or framing members are off to the sides of the sonotubes, the posts and framing should be adjusted so that they bear completely on top of the concrete sonotubes with no portion of the wood extending over the side. Furthermore, I recommend that at all locations the soil elevation be lowered to a minimum of 2 inches below the top of the sonotube. Furthermore, a minimum of 2 inches of air space should exist below the

bottom of framing members to prevent the potential of frost heaving the framing. Slope all portions of soil to drain (¼"/ft.) so no pockets occur where water can collect.

I also recommend that along the right side of the deck there be diagonal bracing extending from the bottom of the posts up to the top of adjacent posts to provide lateral stability for the frame. This should also take place at the back of the deck.

The 2x8 beams along the right side of the deck (supporting the joists) clearly need to be upgraded so that proper support is provided. Either the beams should be increased in size or additional support should be provided. The connection between the beams and the posts needs to be revised so that the beam is bearing directly on timber framing as opposed to being face-nailed into the sides of the posts.

The riser distance at all steps should be modified so that they are consistent as required by code.

As indicated in the evaluation portion of the report, the retaining wall will eventually need to be substantially reinforced or replaced to support the lateral soil loads.

6.0 CONCLUSION

In conclusion, it appears that with regard to safety there are a series of items which can and should be implemented immediately. As noted in the report, additional reinforcement or replacement of the retaining wall should be anticipated in the near future.

These recommendations are based upon visual evidence available at the time of the inspection. If you have questions regarding this report or if I can be of further service in this matter, please do not hesitate to call me.

Sincerely,

David A. Price, P.E.
Director of Engineering

DAP/ja
cc: Steven H. Kommel

j:\wpdocs\project\proj98\russo.rep

STATE OF MAINE
DAVID
A
PRICE
#6401
REGISTERED
PROFESSIONAL ENGINEER